TACMET Weather Station MAWS201M

USER'S GUIDE

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VAISALA

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CHAPTER 1

GENERAL INFORMATION

This chapter provides general information about this manual and important safety information you should know before installing and operating TACMET Weather Station.

About This Manual

This manual provides information for installing, operating, and maintaining the TACMET MAWS (later referred to as TACMET MAWS).

Contents of This Manual

This manual consists of the following chapters:

- Chapter 1, General Information: This chapter provides general information about this manual and important safety information you should know before installing and operating TACMET Weather Station.
- Chapter 2, Product Overview: This chapter introduces TACMET MAWS features, advantages, and the product nomenclature.
- Chapter 3, Installation: This chapter provides information about preparing the installation and siting the station. It also contains detailed information on installing the tripod and all the sensors.

- Chapter 4, Operation: This chapter contains information that is needed to operate TACMET MAWS with the handheld terminal and MIDAS IV software.
- Chapter 5, Maintenance: This chapter provides information that is needed in the basic maintenance of TACMET MAWS.
- Chapter 6, Troubleshooting: This chapter lists the possible problems that may occur during the operation and possible solutions to these problems.
- Chapter 7, Technical Data: This chapter provides technical data of the TACMET Weather Station.

Feedback

Vaisala Customer Documentation Team welcomes your comments and suggestions on the quality and usefulness of this publication. If you find errors or have other suggestions for improvement, please indicate the chapter, section, and page number. You can send comments to us by e-mail: manuals@vaisala.com.

Safety

General Safety Considerations

Throughout the manual, important safety considerations are highlighted as follows:

WARNING	Warning alerts you to a serious hazard. If you do not read and follow instructions very carefully at this point, there is a risk of injury or even death.

CAUTION	Caution warns you of a potential hazard. If you do not read and follow instructions carefully at this point, the product could be damaged or important data could be lost.

NOTE	Note highlights important information on using the product.

Product Related Safety Precautions

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. They are recommended precautions that personnel must understand and apply during many phases of installations, operations and maintenance.

WARNING	Be careful when touching and moving TACMET MAWS. See that there are no power lines or other obstacles above the mast.

WARNING	Secure the TACMET MAWS properly with the help of the pegs and/ or sandbag to prevent it from falling. Tighten all the adjustment screws well.

WARNING	Do not operate in an explosive atmosphere. Do not operate the equipment in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a serious safety hazard.

WARNING	Do not attempt to service the product or make any internal adjustment unless another person, capable of rendering first aid and resuscitation, is present.

WARNING	Operating personnel must not remove instrument covers. Component replacement or internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist for some time even with the power cable disconnected. To avoid injuries, disconnect power and discharge circuits before touching them.

WARNING	Do not service a live system outdoors. Do not open the units outdoors when the enclosure contains line voltage levels.

CAUTION	Be careful when moving the mast. To prevent damage to the sensors, remove them (and the sensor arms) before moving the station.

CAUTION	Do not install substitute parts or modify the unit. Improper modification can damage the product or lead to malfunction. Contact Vaisala for repairs to ensure that safety features are maintained.

NOTE	Send old batteries to secondary lead smelter for recycling. Place neutralized slurry into sealed containers and handle in accordance to local, state, and federal regulations. Large water-diluted spills, after neutralization and testing, should be managed in accordance with approved local, state, and federal requirements. Consult state environmental agency and/or federal EPA (Environmental Protection Agency).

ESD Protection

Electrostatic Discharge (ESD) can cause immediate or latent damage to electronic circuits. Vaisala products are adequately protected against ESD for their intended use. However, it is possible to damage the product by delivering electrostatic discharges when touching, removing, or inserting any objects inside the equipment housing.

To make sure you are not delivering high static voltages yourself:

- Handle ESD sensitive components on a properly grounded and protected ESD workbench. When this is not possible, ground yourself with a wrist strap and a resistive connection cord to the equipment chassis before touching the boards. When neither of the above is possible, at least touch a conductive part of the equipment chassis with your other hand before touching the boards.
- Always hold the boards by the edges and avoid touching the component contacts.

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Warranty

For certain products Vaisala normally gives a limited one-year warranty. Please observe that any such warranty may not be valid in case of damage due to normal wear and tear, exceptional operating conditions, negligent handling or installation, or unauthorized modifications. Please see the applicable supply contract or Conditions of Sale for details of the warranty for each product.

CHAPTER 2

PRODUCT OVERVIEW

This chapter introduces TACMET MAWS features, advantages, and the product nomenclature.

Overview of TACMET MAWS

TACMET MAWS is an automatic weather observation system suited for demanding tactical military needs. TACMET MAWS is a compact weather station that accesses and processes data from its sensors, performs data quality control, as well as formats data for output in application specific formats. The system is designed to be portable, capable of quick deployment worldwide, and operative in tactical situations under various environments.

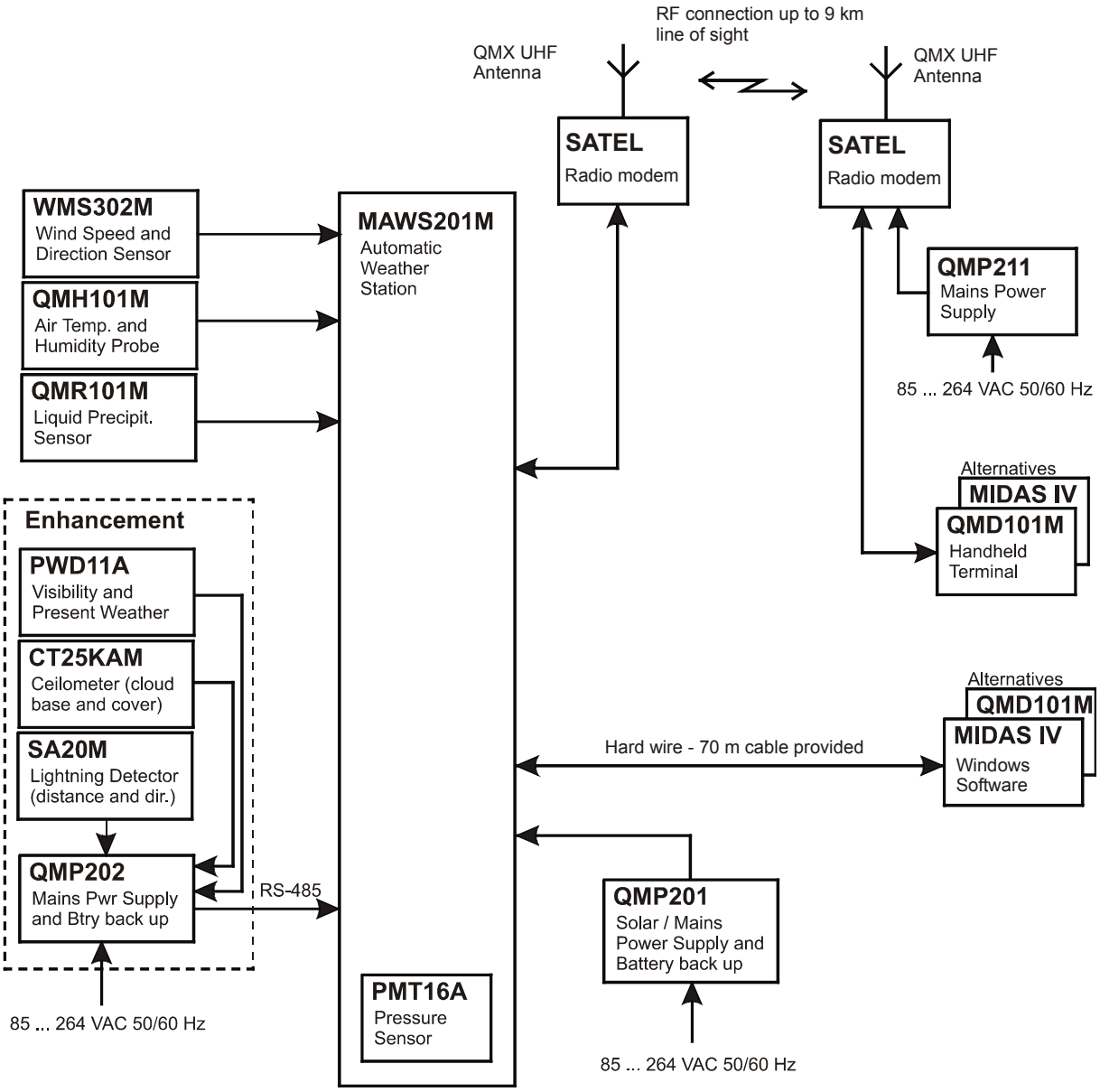

Figure 1 Block Diagram of the Basic System and Enhancement

Figure 2 Complete TACMET MAWS Can Be Installed and Operated by One Person

Basic System

The TACMET MAWS Basic System offers high performance in a very compact package, integrated upon a steady tripod design. The system is powered either by AC (mains) power or by an integrated solar panel when no AC power is available. Backup battery of 7 Ah is available, providing a minimum of 7 days of operation without recharging.

Figure 3 TACMET MAWS Basic System

TACMET MAWS basic system interfaces with the basic sensor set of wind speed and direction, barometric pressure, air temperature, relative humidity, and precipitation. In addition to the basic functions of powering and measuring the sensors, the logger also processes statistical calculations, performs data quality control and formats data for output in application-specific formats.

Enhanced System

The Basic System is easily enhanced with the sensors needed to support aviation; cloud height and coverage, visibility, present weather, and lightning detection. The additional sensors are all powered by AC (mains) power. In case of AC (mains) power loss, the backup battery supply (with an in-built charger) will support operation in limited mode for 24 hours.

Figure 4 TACMET MAWS Enhanced System

The data can be viewed by using the Handheld Terminal QMD101M and/or by the workstation software MIDAS IV. Both of these displays can be connected to the TACMET MAWS system by using either landline cable or UHF/VHF radio modems.

MAWS Operating Software

The embedded operating software runs in the AWS logger QML102T. Access to the limited set of commands can be gained using the Handheld Terminal QMD101M or using MIDAS IV PC.

AWS Logger QML102T

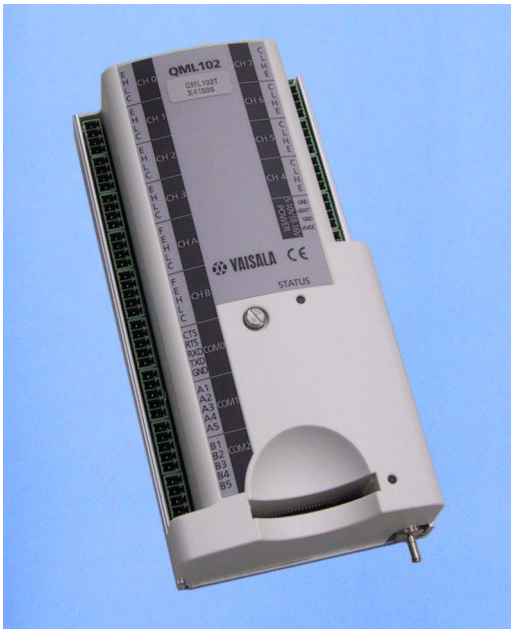

Figure 5 Logger QML102T

QML102T is a complete AWS logger designed on one printed board. The QML102T logger is located in the tube and is further encased to protect the circuit board and the internal battery. The cover of this protective housing can be removed for installation of the battery and for maintaining MAWS.

The logger board contains a 32 bit Motorola CPU for data processing and 10 differential (20 single ended) analog sensor inputs, that can also be used as digital inputs. Moreover, there are two frequency sensor interfaces, a 16 bit A/D converter, 1.7 Mbytes of secure Flash memory for data logging, as well as charger for the internal backup battery.

Optional modules under the housing include, for example, various communication modules, and a built-in pressure transducer.

Internal Battery QMB101

The TACMET MAWS system has an internal battery QMB101 placed on top of the circuit board, under the logger cover. Backup capacity with average power consumption of 10 mA (basic set of 5 sensors, 10 minute measuring interval) is 130 hours. The battery can be charged with the QML102T logger. For temporary storage periods the QML102T logger can be commanded into the sleep mode to prevent the battery from deep discharge.

Solar/Mains Power Supply Unit QMP201 with Solar Panel

Figure 6 Solar/Mains Power Supply QMP201

The solar panel SOLAR12 is a custom-designed module incorporating high power efficiency, quality, and ruggedness. The 12 W panel contains 36 poly crystalline silicon cells. The cells are protected from dirt, moisture, and mechanical impact by a tough fluoropolymer front film. The solar circuit is laminated using EVA between this film and a durable glass fiberboard backsheet for superior moisture resistance. The

angle of the solar panel is adjustable to optimize charging at all latitudes.

QMP201 houses a sealed and maintenance free 7 Ah battery. The battery is charged by solar panel using Battery Regulator QBR101. In addition, the backup battery is also charged through the AC (mains) power supply when the AC (mains) power is available.

Power Supply and Connection Unit QMP202

Figure 7 Power Supply Module QMP202

Power Supply Module QMP202 is used for supplying voltage to the enhanced sensors. QMP202 includes the following modules: battery regulator QBR101, mains power supply BWT15SX and two 24 Ah back-up batteries.

Data from the enhancement sensors is transferred through the QMP202 unit to the TACMET MAWS logger.

Mains Power Supply Module QMP211

Figure 8 Mains Power Supply Module QMP211

The AC (mains) power supply module QMP211 is a switching power supply, which operates from the universal AC input of 100 to 240 VAC and 50/60 Hz. The output voltage is 12 VDC (2500 mA), which is used for powering the radio modem when it is connected to the MIDAS IV PC for configuring or for powering the Handheld Terminal indoors.

Power Strip QPS101

Figure 9 Power Strip QPS101

Power Strip QPS101 is a safety switch, which is used in connecting the QMP202 to AC (mains) power outlet. QPS101 has two buttons: the test button for the circuit breaker and the current switch. The circuit breaker activates when the leakage is over 30 mA.

Handheld Terminal QMD101M

Figure 10 Handheld Terminal QMD101M

QMD101M is a lightweight, rugged and easy-to-read handheld display device for viewing measured and calculated parameters and alarms, as well as for setting station-specific parameters

Workstation with MIDAS IV Software

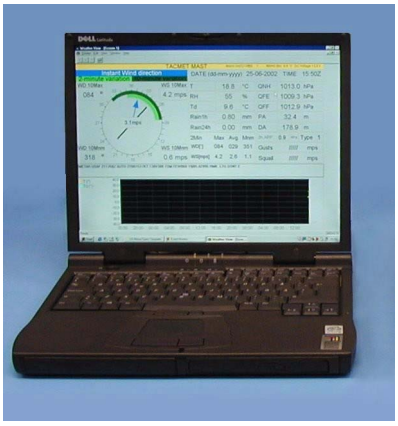

Figure 11 Workstation Laptop with MIDAS IV Software

The workstation software MIDAS IV is installed onto a laptop PC. The MIDAS IV software operates in the Microsoft® Windows®2000 operating system, providing multi-tasking operation and connectivity. The workstation displays numerical and graphical data, codes METAR/SPECI aviation weather reports, as well as archives and transmits data for further processing. The Windows®2000 environment is user-friendly and provides great flexibility. MIDAS IV uses the standard Windows® user interface and features, and is therefore straightforward and easy to learn.

The workstation software facilitates editing METAR/SPECI reports by easy-to-use templates. Aviation special weather reports (SPECI) are generated automatically whenever selected criteria are met, or at any time initiated by the operator. Report transmission can also be fully automated, if necessary.

In addition, the software provides real-time graphical data display in multiple windows. Stored data can be viewed in ASCII format. The operator can monitor system performance and sensor alarms with Event Monitor.

Data is archived for 30 days on hard disk and sent to other systems via serial port or as an FTP transfer via LAN.

Radio Modem

Figure 12 Radio Modem SATELLINE 3AS

Radio modems provide wireless data communication between TACMET MAWS and handheld terminal or TACMET MAWS and MIDAS IV PC.

The SATELLINE 3AS half-duplex UHF radio modem is suitable for high-speed data applications. It provides data speeds 19200 bps at 25 kHz and 9600 bps at 12.5 kHz in the air. RS interface data speed is user selectable from 300 to 38400 bps. The radio modem comes with a ready-made cable and a special weatherproof enclosure.

UHF Antennas

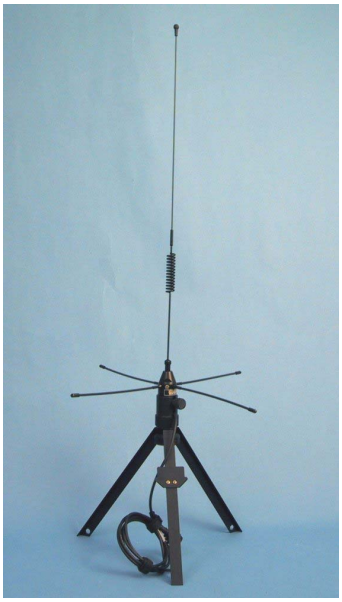

Figure 13 UHF Antenna on Tripod

The UHF antenna can be installed on the tripod and on the mast. The frequency range is from 410 to 470 MHz.

Combined Wind Speed and Direction Sensor WMS302M

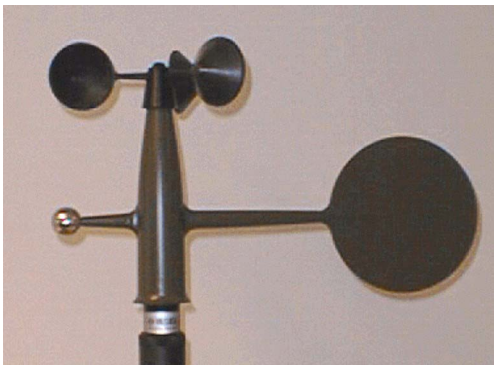

Figure 14 Combined Wind Speed and Direction Sensor WMS302M

The WMS302M sensor monitors both the speed and direction of the wind with excellent linearity and fast response. A single compact sensor is ideal for low-power applications.

The direction is detected using an axial symmetric rotating potentiometer with two slides, thus providing a full range from 0 to 360 degrees. Wind speed is converted into pulses using two reed relays. The materials are carefully selected for the optimum performance under both light winds and severe weather conditions.

Rain Gauge QMR101M

Figure 15 Rain Gauge QMR101M

Rain Gauge QMR101M is an economical and accurate rain gauge made of plastic, which is frostproof and highly resistant to UV-radiation. QMR101M has a self-emptying tipping spoon of 0.2 millimeters capacity. QMR101M comes with a ready-made cable and connector.

Air Temperature and Relative Humidity Sensor QMH101M

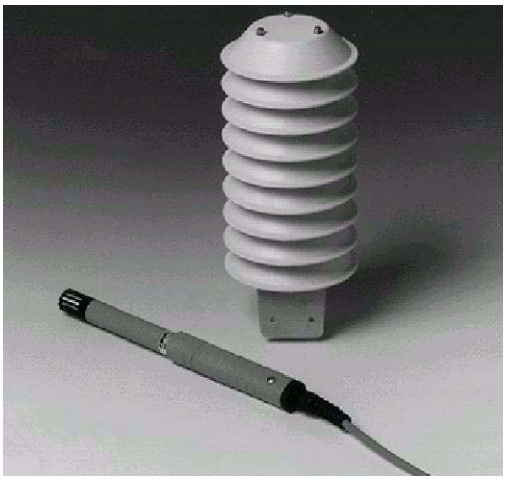

Figure 16 QMH101M with Radiation Shield

Air Temperature and Relative Humidity Sensor QMH101 is based on Vaisala's field-proven HMP45D probe and comes with a special cable and connector. For humidity measurements, the HUMICAP® sensor is highly accurate and offers excellent long-term stability in a wide range of environments. Temperature measurements are taken by an accurate Pt-100 IEC751, 1/3 Class B.

Replacement is simple; the probe head containing the electronics can be quickly removed from the probe body, while a replacement is installed and the measurement continues. Meanwhile the other probe head can be calibrated.

The probe is installed in a naturally aspirated shield made of injection molded UV stabilized plastic. The shield has a multiplate design providing the necessary shielding from solar radiation and precipitation.

Pressure Sensor PMT16A

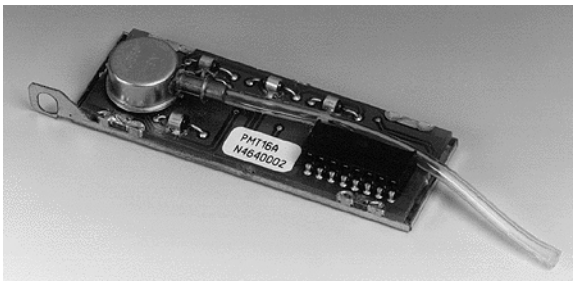

Figure 17 Pressure Sensor PMT16A

The silicon capacitive pressure sensor PMT16A has excellent accuracy, repeatability, and long-term stability over a wide range of operating temperatures. It maintains its accuracy and calibration for long periods of time, thus reducing the need for field calibrations.

The fine adjustment and calibration of the sensor at the factory are handled according to the electronic working standards, which are based on international standards.

Present Weather Detector PWD11A

Figure 18 Present Weather Detector PWD11A

Present Weather Detector PWD11A is an intelligent multivariable sensor for automatic weather observing systems. The sensor combines the functions of a forward scatter visibility meter and a present weather sensor. In addition, PWD11A can measure the intensity and amount of both liquid and solid precipitation.

The versatility of PWD11A is achieved with a unique operating principle. PWD11A measures an estimate of the precipitation water content with a capacitive device and combines this information with optical scatter and temperature measurements. These three independent measurements together sufficiently provide data for an accurate evaluation of the prevailing visibility and weather type.

PWD11A is calibrated with reference to a highly accurate transmissometer. An extensive self-diagnostic procedure continuously monitors the sensor status. Dirt and foreign particles on the lens are detected automatically, minimizing the risk of false high values. A special calibration kit is provided as an option for conducting field calibration under practically all weather conditions.

PWD11A is small in size and lightweight, thus being easy to install on the sensor arm. In addition to the standard sensor operation, the TACMET MAWS software adds extra features such as reporting of coded weather type identifications as plain text in the output reports.

Ceilometer CT25KAM

Figure 19 Ceilometer CT25KAM

CT25KAM employs pulsed diode laser LIDAR (Light Detection and Ranging) technology for cloud detection, precipitation, and other obstructions to vision, and accurate cloud heights and vertical visibility determination.

The standard measurement range of CT25KAM extends up to 25 000 feet (7.5 km) covering most heights where dense clouds appear. The instrument is capable of reporting up to three cloud layers simultaneously. It detects the cloud base reliably in fog, rain, snow, and haze. If the cloud base is obscured, CT25KAM measures and reports vertical visibility.

Extensive internal monitoring is supported by a comprehensive set of user commands that can be given locally or remotely. Internal monitoring includes a sensor measuring the outgoing laser pulse energy, circuitry that checks receiver sensitivity, a sensor monitoring window contamination, and two sensors measuring the tilt angle. These and other internal measurements are used by the diagnostics software and the detection algorithm for maximum reliability and ease of use.

A special additional tilt sensor is provided as standard for automatically compensating uneven terrain. Installation is made easy and fast when no exact leveling is required. The cloud coverage algorithm in the

CT25KAM is a further development of the algorithm specified by FAA. Cloud coverage (amount) is reported in 0 to 8 octas, according to WMO regulations.

Lightning Detector SA20M

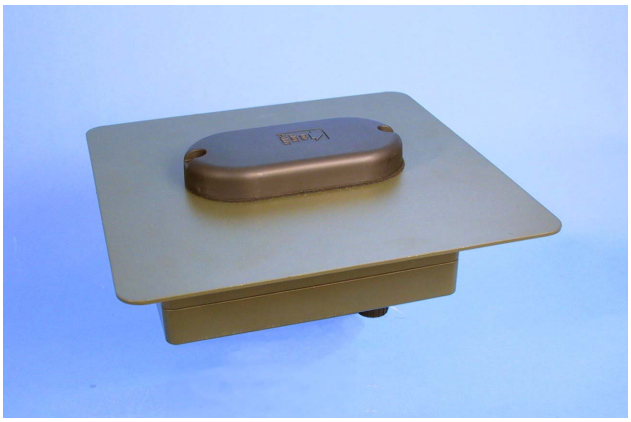

Figure 20 Lightning Detector SA20M

Lightning Detector SA20M detects the position of lightning activity and reports lightning and thunderstorm positions with respect to the location of SA20M. SA20M is self-contained and weather-tight.

The SA20M sensor detects cloud-to-cloud, cloud-to-air and cloud-to-ground lightning activity to a range of 90 km (50 nmi.). The ability to detect intercloud activity allows SA20M to report lightning during the building stages of a thunderstorm, before sufficient charge build-up has occurred that would generate a ground strike. Consequently, SA20M provides early warnings of potentially fatal single-event ground strikes.

Equipment Nomenclature

Table 1 TACMET MAWS Nomenclature (Refer to Figure 21 on page 32)

Code		Common Name	Number in Figure
Basic system	QML102T	Logger (inside enclosure)	
	PMT16A	Pressure sensor (inside logger)	
	WMS302M	Combined wind direction and speed sensor	10
	QMH101M	Air temperature and relative humidity probe	4
	QMA102M	Sensor arm with radiation shield	2
	QMR101M	Rain gauge	3
	Tripod	Tripod with the enclosure and accessories	15
	QM30154	Telescopic wind sensor mast	12
	QMY103M	Set of ground and foot pegs for tripod	
	QMP201	Solar/mains power supply with solar panel and battery back-up	16
	QMD101M	Handheld terminal	14
	TacLap PC	MIDAS IV PC	8
	MIDAS IV	Software for the MIDAS IV PC	
	MC-2G	Hand bearing global compass	
	QPS101	Outdoor power strip	
	QPS102	Indoor power strip	
	QTR101	Transit case for sensors	
	QTR102	Transit case for tripod and mast	
	QTR103	Transit case for tools and spares	
Enhancement	CT25KAM	Ceilometer	17
	QM40142	Ground pegs for CT25KAM	
	PWD11A	Present weather detector	13
	SA20M	Lightning detector	6
	SAT111	Tripod for SA20M	7
	QM40287	Grounding net and ground pegs for SA20M	
	QMP202	Power supply module and battery back-up	18
	QTR104	Transit case for CT25KAM and SA20M	
	QTR105	Transit case for PWD11A, QMP202, and SAT111	

Table 2 Communication Options (Refer to Figure 21 on page 32)

Code	Common Name	Number in Figure
SATELLINE3AS	Radio modem	5
QMX101M-x	UHF antenna 410 ... 470 MHz	1
QM30185	Antenna arm for TACMET MAWS tripod	11
QM30176	Antenna tripod for PC end	9
QMP211	Mains power supply for radio modem or handheld terminal	

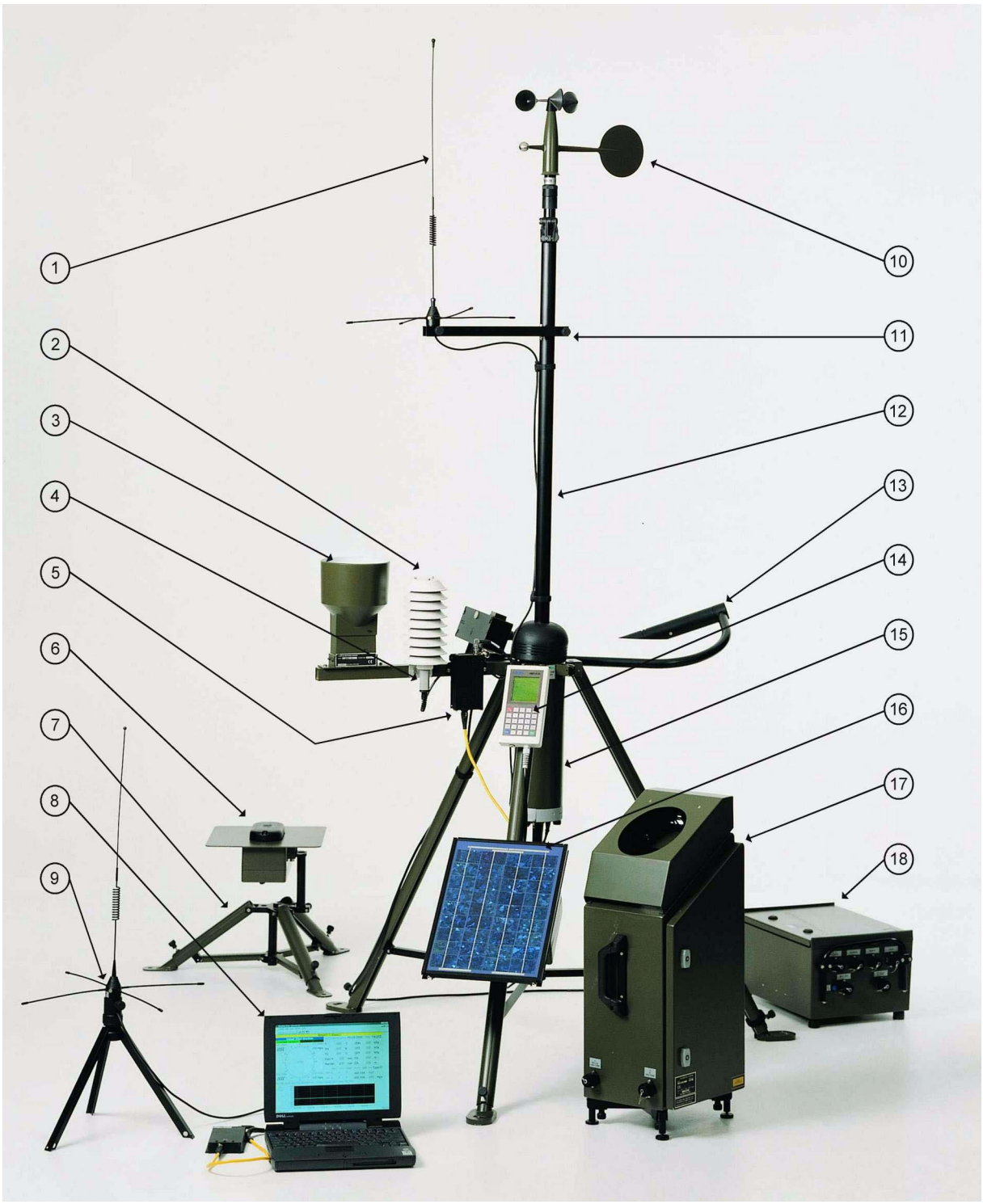

Figure 21 TACMET MAWS with Basic and Enhancement Equipment

NOTE The appearance of the antenna and the solar panel on your TACMET MAWS may differ from the one on the figures.

Table 3 Cables Provided

Standard Nomenclature		Common Name
Basic system	ZZ45202	PC cable with DC connector, 5 m (15 ft.)
	ZZ45114	3 landline cables for PC or handheld terminal, 22.5 m (75 ft.) each
	ZZ45121	Mains cable with US std. plug, 5 m (15 ft.)
	DRW011179	Radio - TACMET MAWS connection cable, mounted to the modem, 1 m (3 ft.)
	DRW011180	Radio - PC connection cable, mounted to the modem, 1 m (3 ft.)
Enhancement	CT45300	AC supply cable for CT25KAM
	CT45298	DC / data cable for CT25KAM
	ZZ45215	SA20M connection cable
	ZZ45121	Mains cable with US std. plug, 5 m (15 ft.)
	ZZ45123	Enhanced Sensor Set Connection Cable to TACMET MAWS, 5 m (15 ft.)

Table 4 Tools and Spare Parts

Standard Nomenclature	Common Name
16139	Battery case (QMP202) key
19558	Velcro belts, set of 10, length = 10 in (250 mm)
25925	Allen wrench, 4 mm
25926	Hammer, 2 lb. (0.9 kg)
26073	UHF antenna without cable
2622	International adapter kit
26271	Screwdriver, 5.5 mm, length = 1 in (25 mm)
4017	Back-up battery 12 V, 7 Ah
4185	Allen wrench, 3 mm
CD	Midas IV Software on CD
QMD101M	Handheld display with tripod fixture
QTR103	Transit case for tools and spares
WMS302M	Wind sensor

TACMET MAWS Serial Number Record

Table 5 Basic System Serial Number Record

Part number	Serial number
TACMET MAWS (system)	
HMP45DX (air temperature/relative humidity sensor probe head)	
DTR502	
QMP201 (power supply)	
QMR101M (rain gauge)	
QMD101M (handheld terminal)	
QMD101M (spare handheld terminal)	
WMS302M (wind)	
WMS302M (spare wind)	
SATEL3AS (radio modem)	
SATEL3AS (radio modem)	

Table 6 Enhancement Serial Number Record

Part number	Serial number
CT25KAM (ceilometer)	
PWD11A (present weather)	
QMP202 (enh. power supply)	
SA20M (lightning detector)	

CHAPTER 3
INSTALLATION

This chapter provides information about preparing the installation and siting the station. It also contains detailed information on installing the tripod and all the sensors.

Preparing Installation

All the required tools are supplied in the QTR101 or QTR103 transit cases.

Tools needed:

- MC-2G compass to establish the system orientation
- Ground pegs for securing the tripod
- Hammer for hitting the ground pegs into ground
- Allen wrenches
- Screwdriver.

One person can complete the whole installation. Depending on the set of sensors, the installation should not take more than half an hour.

Unpacking Instructions

When you have received the delivery, check the sensors, make an inventory against the packing list, and check that sensors have not been damaged during transportation.

NOTE	Store all the sensors and other devices in their transit cases.

The logger electronics are attached to the railing inside the tube. The tripod is already assembled, but needs to be attached to the telescopic mast.

Siting the Station

Finding a suitable site for the weather station is important for getting representative ambient measurements. The site should represent the general area of interest.

Using the Compass

When aligning the station, it is essential to use the compass correctly. The Global Compass MC-2G works reliably everywhere in the world.

Figure 22 Global Compass MC-2G

When you are in the northern hemisphere, you should determine south to align TACMET MAWS. With the compass, do the following:

1. Open the compass lid completely.

2. Rotate the capsule until the scale ring is at 180° (south). See the reading line on Figure 23 on page 37. When you are in the southern hemisphere, you should determine north (compass bearing is 0°) to align TACMET MAWS.

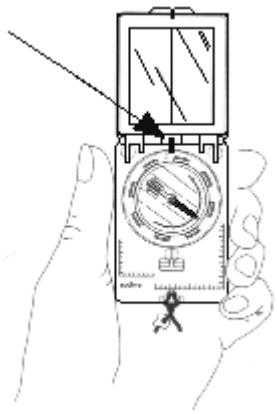

Figure 23 Reading Line

3. Open the compass lid at a 60° angle.
4. Place the compass horizontally at the eye level at a distance where sighting is easy. Aim so that the sighting line of the mirror runs in the middle of the capsule view (see Figure 24 on page 37). Turn your body around until the arrow at the base is parallel to the compass indicator and the orange north end of the indicator points to the red arrow. Make sure you keep the compass in an upright position and the sighting line remains in the middle.

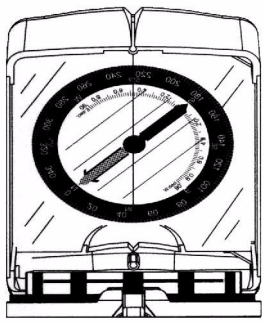

Figure 24 Sighting Line of the Mirror Runs in the Middle of the Capsule View

5. Do not move the compass. Look through the sighting notch and select a landmark, or example, a tree. Now you know where is

south and you can align the station so that the solar panel faces south.

NOTE	It is important that there are no magnetic objects nearby when using a compass. Objects such as knives, belt buckles, metallic cans, tools, audio equipment, and glasses with metal frames can cause an erroneous reading if kept close to the compass.

NOTE	The luminous marks on the north needle and at the base plate gradually lose their luminous effect in the dark. You can restore the luminous effect by illuminating the compass briefly, for example, with a flashlight.

Solar Radiation

When aligning TACMET MAWS in the northern hemisphere, the solar panel should face south, and the temperature and humidity sensor be on the western side of TACMET MAWS. When aligning the weather station in the southern hemisphere, the solar panel should face north, and the temperature and humidity sensor be on the eastern side of TACMET MAWS. Make sure that no building or object will shadow the station (especially the solar panel) during the day (see Figure 25 on page 39).

Wind Measurement

Allow sufficient clearance for the wind sensors, that is, the station should not be located next to a building or any other object that might affect the airflow.

In general, any object of height (h) will not remarkably disturb the wind measurement at a minimum distance of 10 × h. For example, locate the weather station at least 100 feet away from a 10-foot-high tree. See Figure 25 on page 39.

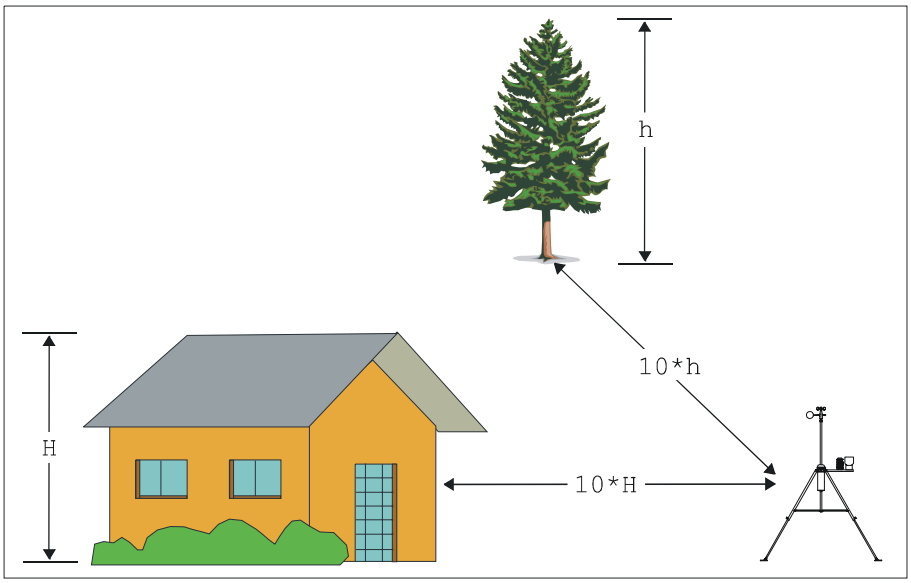

Figure 25 Siting the Station

Rain Gauge

The rain gauge is installed on the same sensor arm with the temperature and humidity probe. In general, objects should not be closer to the gauge than a distance twice their height above the gauge opening. Sites on a slope or on the roof of a building should be avoided.

Air Temperature and Humidity Measurement

NOTE	The radiation shield is important in protecting the sensor from direct sunlight and should always be used.

The tripod already determines a suitable height for the sensor. Avoid the following installation sites to ensure correct measurements: shaded areas, rooftops, steep slopes, heat sources, swamps, high vegetation and places that might hold water after rains.

Present Weather Detector

The Present Weather Detector PWD11A is installed on the short arm of the TACMET MAWS tripod. Avoid setting the system up near high brush or grass, because foreign objects in the sample volume may cause sudden changes in the scatter signal.

Cloud Ceilometer

Align the ceilometer with the optical window pointing away from the sun (north in the northern hemisphere, whereas south in the southern hemisphere) to keep excess sunlight from out of the sensor.

Make sure that the ceilometer stands firmly on the terrain. The unit does not have to be mounted vertically straight, because the unit is equipped with two tilt-angle sensors.

Lightning Detector

The main siting consideration for Lightning Detector SA20M is interference from local obstructions. Any conducting object that presents a profile of approximately 30 degrees, or more, above the horizon of the antenna ground plane is an obstruction (see Figure 26 on page 40).

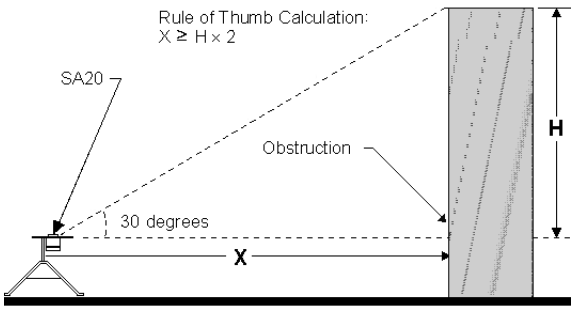

Figure 26 SA20M Vertical Obstruction (Side View)

The horizontal angle obstructed by an object should not be greater than 5 degrees; larger angles than this will affect accurate reporting of strike bearing in the direction of the object as shown in Figure 27 on page 41. The size of the obstruction dictates the degree of the inaccuracy.

However, obstructions do not greatly effect the detection efficiency of SA20M. In general, it is desirable to have no obstructions to the sensor.

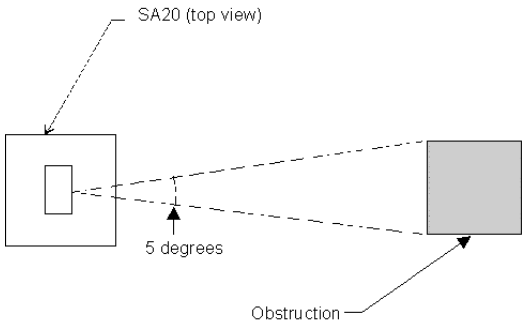

Figure 27 SA20M Horizontal Obstruction (Top View)

For a metal building (very wide, solid metallic wall) that is 9 m (30 feet) taller than the mounted height of SA20M, the sensor should be placed at least 18 m (60 feet) away as shown in Figure 26 on page 40.

Siting of the lightning detector also depends on the location of buried electrical cables and electrical transformers. Site the lightning detector away from emitters of electromagnetic interference, such as buried electrical cables and electrical transformers. SA20M will send a message to the handheld terminal and/or to MIDAS IV if the siting is unsuccessful.

NOTE	SA20M can not be installed in a closed-in structure. It must be installed outdoors facing the magnetic north.

Power Supply Unit

When siting the Power Supply Unit QMP202, place it in a dry location, that is, do not place it in a depression where water might accumulate.

Basic System

The basic system is packed into two transit cases. The third transit case is the Spares and Tool Kit.

Table 7 Contents of Basic System Cases

Transit case	Contents	Dimensions (w × h × l) and weight
QTR101	Sensor arm with rain gauge and temperature and humidity probe, wind sensor, handheld terminal with cable, compass, mains cable for QMP201, 1 power supply, and when included: 2 radio modems, 2 antennas, 2 radio modem cables, 2 rubber antennas	650 × 450 × 250 mm (25.8 × 17.7 × 9.8 in.) 8.2 kg (18 lb.)
QTR102	Tripod with the enclosure and solar panel + accessories, telescopic mast, ground peg bag, landline cables, PC cable, outdoor power strip, manual, and when included: antenna accessory bag	1340 × 370 × 340 mm (52.8 × 14.6 ×13.4 in.) 33.6 kg (74 lb.)
QTR103	Hammer, allen wrench, screwdriver, key for QMP202, Velcro belts, wind sensor, handheld terminal, back-up battery, adapter kit, CD, indoor power strip, and spare antennas when included	650 × 450 × 250 mm (25.8 × 17.7 × 9.8 in.) 10.0 kg (22 lb.)

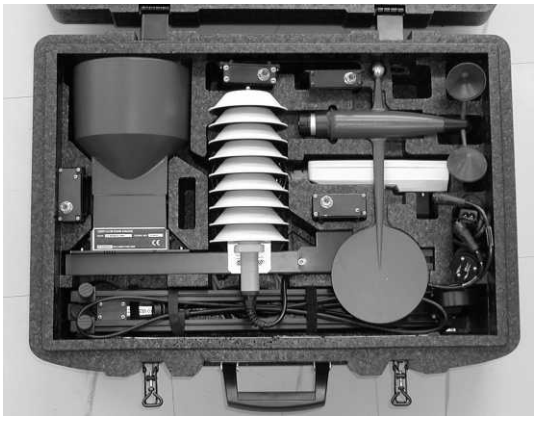

Figure 28 Transit Case QTR101 Opened

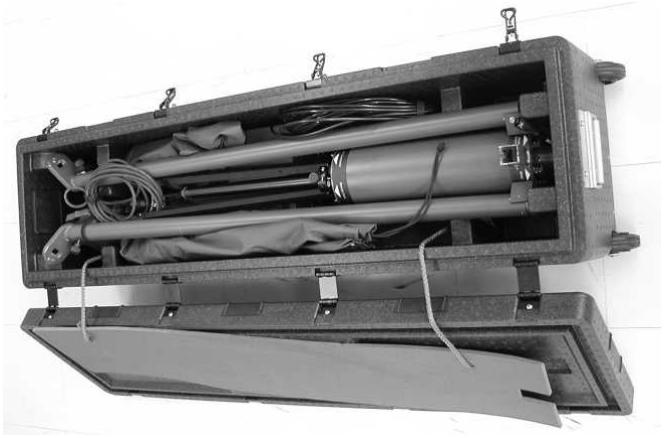

Figure 29 Transit Case QTR102 without Mast

Figure 30 Transit Case QTR102 with Mast

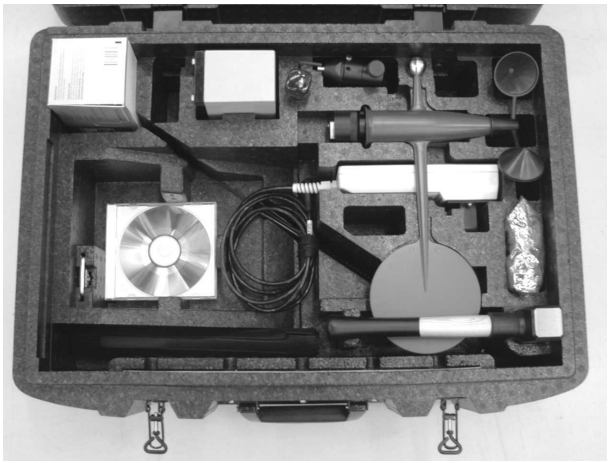

Figure 31 Transit Case QTR103

Weather Station Structure

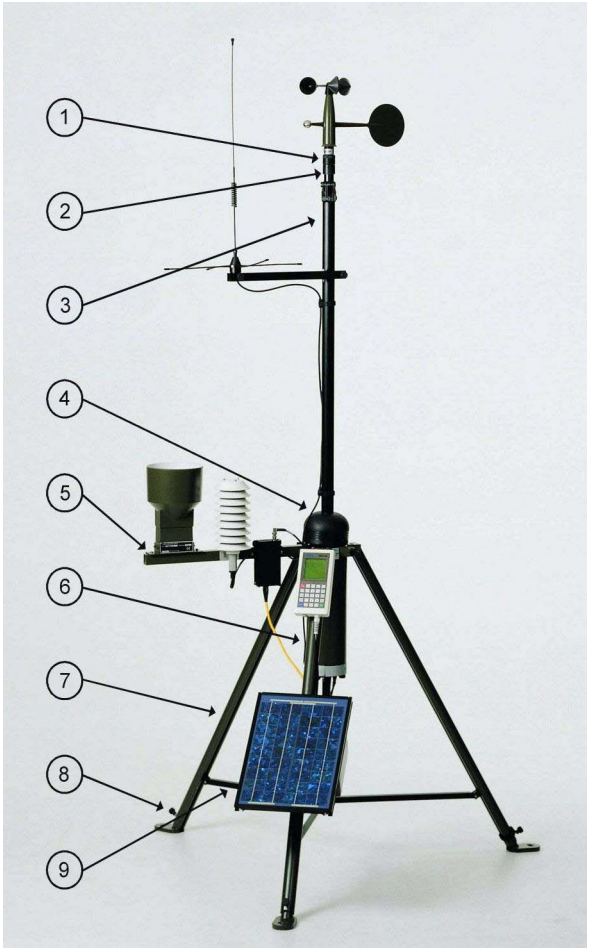

Figure 32 Mechanical Structure of Basic System

The following numbers refer to Figure 32 on page 44:

1 = Plastic collar
2 = Mounting piece
3 = Telescopic mast
4 = Protective cover
5 = Sensor arm
6 = Tube (logger inside)
7 = Telescopic leg
8 = Adjustment screw
9 = Support bar

Installing Tripod, Sensors, and Optional Antennas

When installing the sensors to the tripod, see Figure 32 on page 44 for correct places for the sensors.

1. Place the tripod in an upright position. Loosen the locking ring, spread the legs and push the locking ring all the way to the stop. Lock by tightening the screw. The support bars should be horizontal. Point the solar panel leg towards south in the northern hemisphere (north in the southern hemisphere). See Figure 32 on page 44 and Figure 33 on page 45 for the component names.

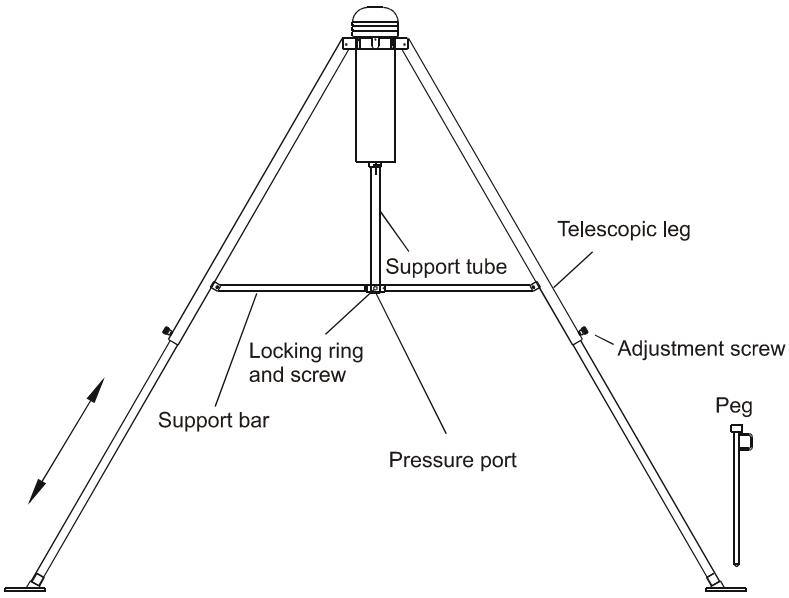

Figure 33 Mechanical Structure of Tripod Legs

2. For attachment of the wind sensor (number 1 in Figure 34 on page 46), the mounting piece has already been tightened with the small hex screw (6) on the top of the telescopic mast. Guide the wind sensor cable (4) through the telescopic mast (if the cable is not already through the mast) and connect the cable to the sensor. To connect the sensor to the mast, align the slot (3) on the bottom of the sensor with the metal tab (5) on the mounting piece. Fix the sensor into its place by tightening the plastic collar (2). For vane alignment instructions, see section Aligning the Wind Vane on page 52.

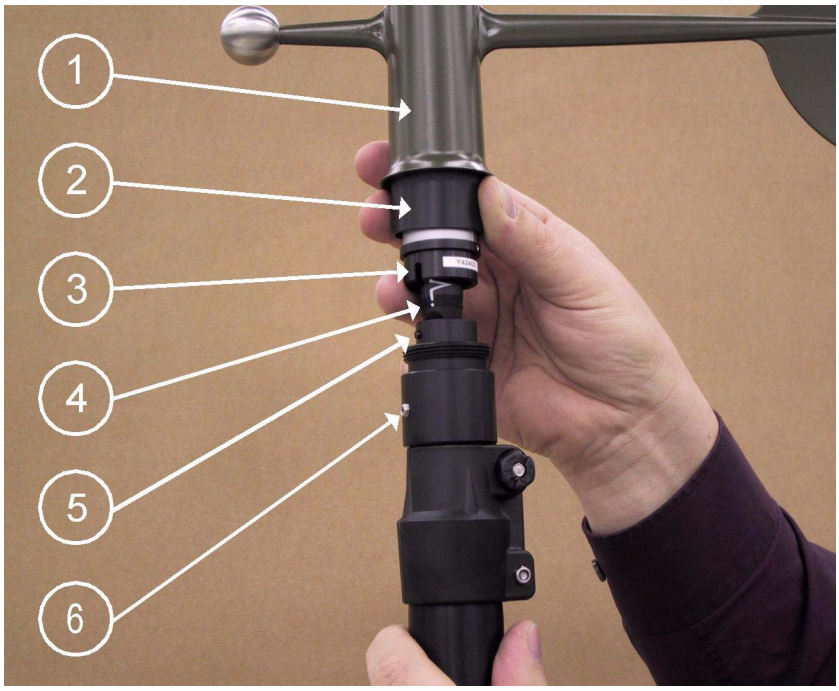

Figure 34 Wind Sensor Attachment

3. Attach the mast to the base. Loosen the hand screw (number 3 in Figure 35 on page 46). Guide the mast into its place with the notch (2) facing the screw. Press the mast in place and hand tighten the hand screw. Take the wind sensor cable out through the opening (1) and connect it to the connector **Wind** marked with a white arrow. Align the marks and gently but firmly press the connector down. The connector will snap in place. Do not turn the connector!

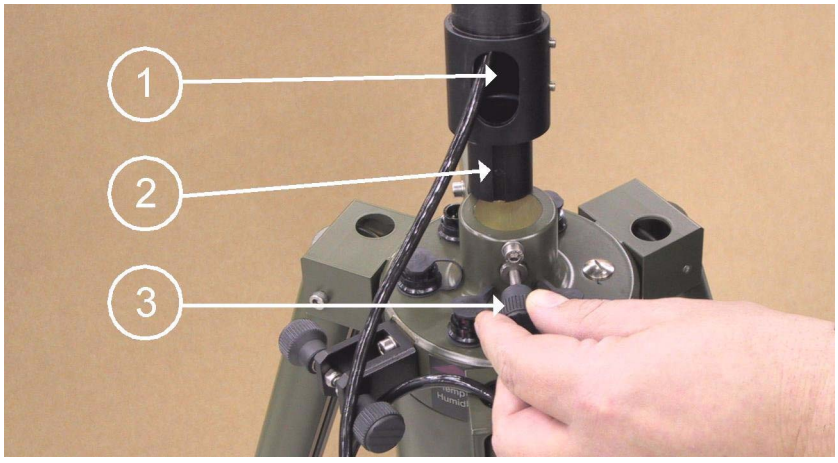

Figure 35 Attaching the Telescopic Mast

4. Fully extend the telescopic mast. Open the latch (1) by lifting it up. Lift the inner mast (2) to the upper position. Close the latch by pushing it down.

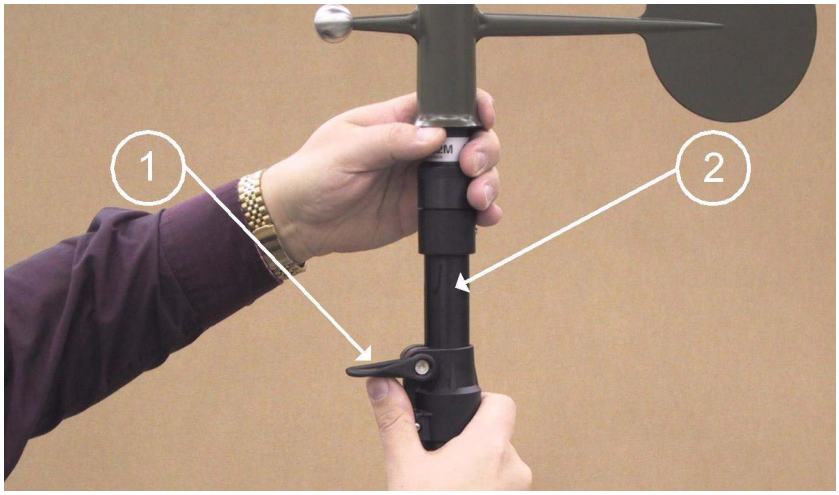

Figure 36 Extending the Telescopic Mast

5. The temperature and relative humidity probe (with radiation shield) and the rain gauge are already assembled to the sensor arm which is in case QTR101. Install the arm to the tripod. Push the arm in place and tighten the two hand screws (number 1 in Figure 37 on page 47).

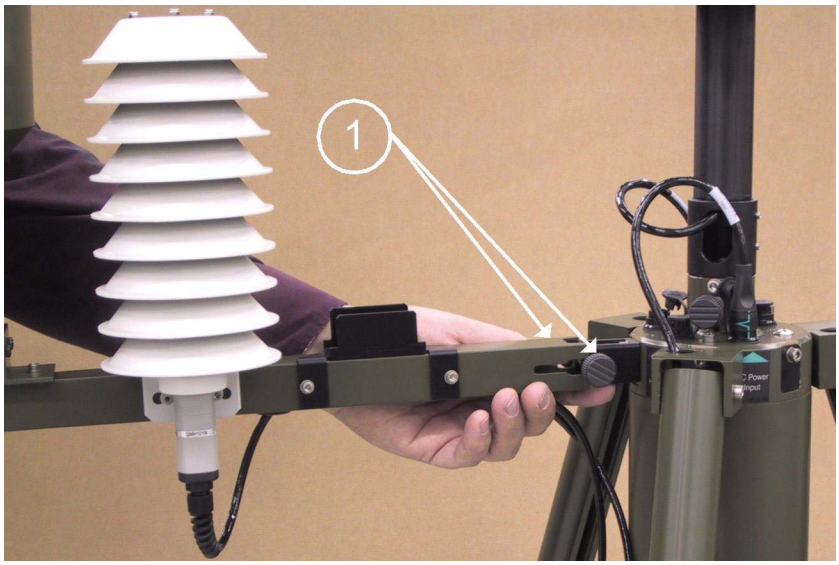

Figure 37 Sensor Arm Attachment

6. To install the UHF antenna:

   a. Attach the antenna arm (number 3 in Figure 38 on page 48) to the mast. Select a desired height (preferably as high as possible). The antenna arm cannot be attached above the locking latch of the mast. Assemble the hook (1) around the mast. The notch (4) in the end of the arm must face up. Turn the arm counterclockwise and secure the arm with the hand screw (2, behind the mast in the figure). Before tightening, turn the arm so that there will be a line of sight between the station antenna and the remote antenna. The mast must not be between the antennas! The antenna must not be over Rain Gauge QMR101M or Present Weather Detector PWD11A.

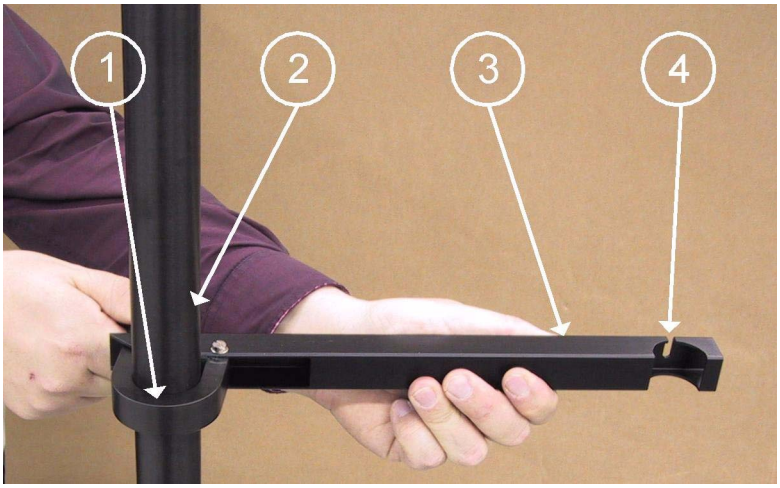

Figure 38 Installing UHF Antenna Arm

   b. Insert the four ground plane elements (number 1 in Figure 39 on page 49) and the radiator (3) to the antenna base (2) by screwing them clockwise.

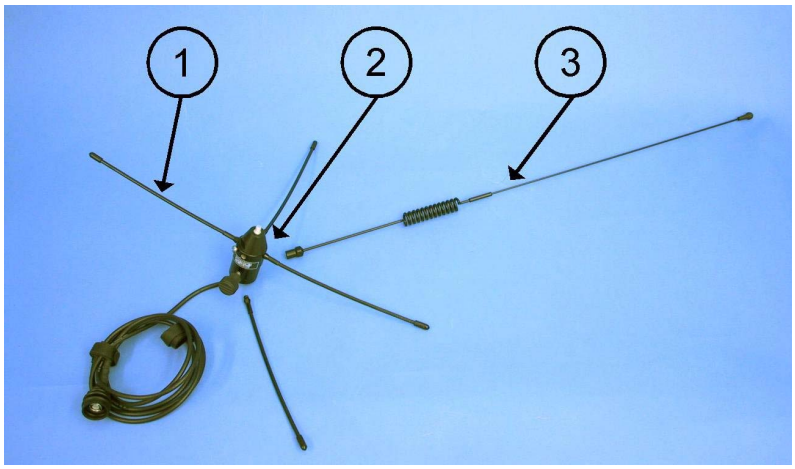

Figure 39 UHF Antenna Assembly

c. Install the antenna so that the hand screw (number 1 in Figure 40 on page 49) faces the notch (2) and tighten the hand screw. Secure the cable to the mast with the Velcro belts.

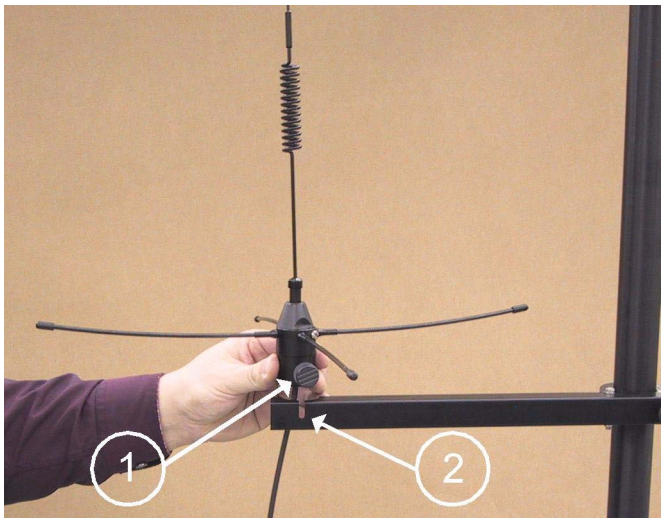

Figure 40 Installing UHF Antenna to Arm

7. Install the radio modem on the same arm as the rain gauge and the radiation shield with the temperature and humidity sensor. Press the back of the radio modem (number 3 in Figure 41 on page 50) against the radio modem adapter between the two hex screws (2). Lower the radio modem down so that it is secured. Connect the antenna cable (1) and the data/power cable (4).

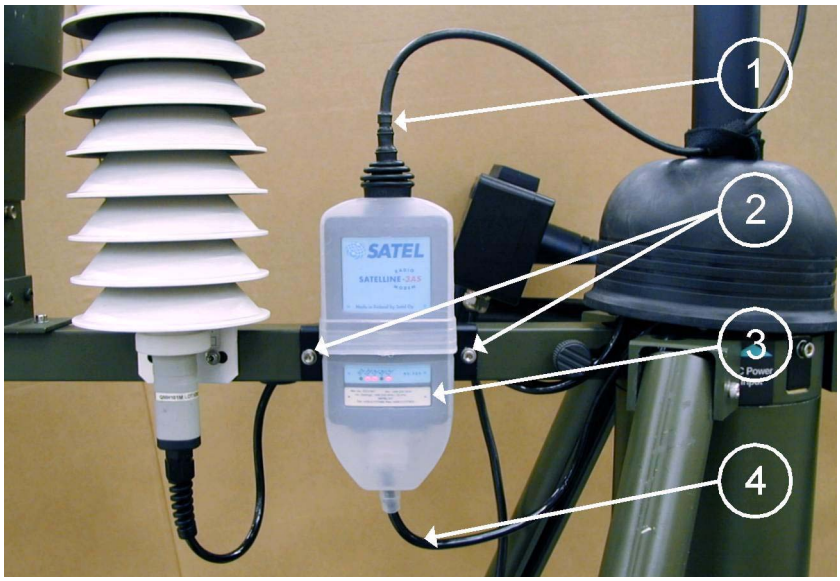

Figure 41 Installing Radio Modem

8. Connect all sensor cables to the connectors on the upper base. Lower the protection cover to shield the connectors.

Table 8 Connectors on the Upper Base

Connector (color)	Sensor
Temp./humidity (red)	QMH101M
Wind (white)	WMS302M
Rain (blue)	QMR101M

CAUTION Be careful not to pinch the cables during installation.

CAUTION Be careful when connecting the cables so that the connector pins will not bend.

9. If the ground is soft (for example, sand or snow), attach the foot pads (number 3 in Figure 42 on page 51) to the tripod legs. After you have attached the foot pad, insert a peg (1) through the hole (3) to the ground to secure the leg.

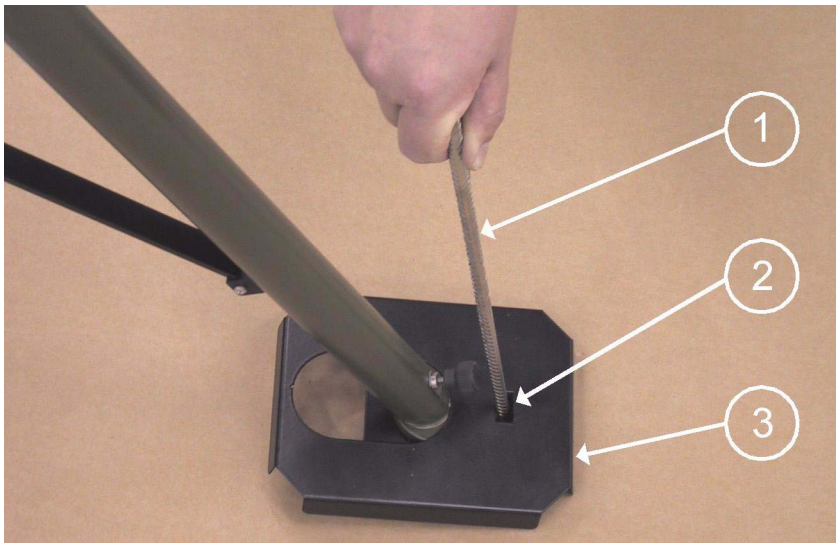

Figure 42 Attaching Foot Pads

10. Check with the bubble level (number 1 on Figure 43 on page 51) that the station is leveled. The air bubble must be inside the circle (2). Adjust the legs to level the station.

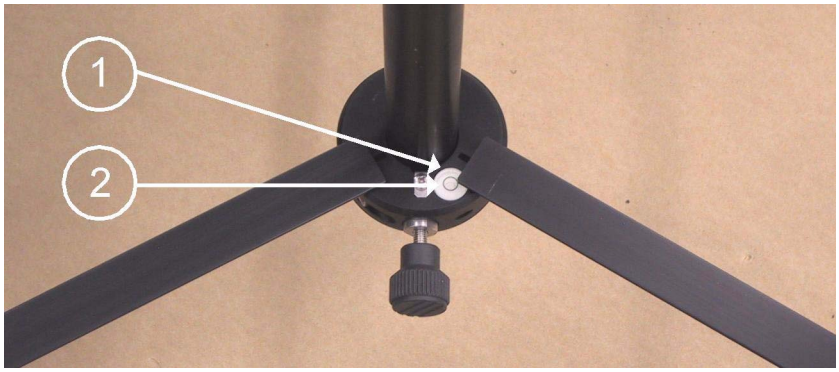

Figure 43 Leveling the Station

11. To adjust the length of the legs, loosen the hand screw (number 1 in Figure 44 on page 52) at the lower end of the leg. Extend the leg and lock by tightening the hand screw. If you do not extend the legs all the way, extend the legs so that the temperature/relative humidity sensor is approximately 1.5 m (5 feet) off the ground. After you have aligned the station, insert a peg through the hole (2) to the ground to secure the leg. Use the hammer to pound in the ground pegs. If the ground is too hard for the pegs, fill the ground peg bag with sand and/or stones. Attach the bag to the horizontal support bar with the straps.

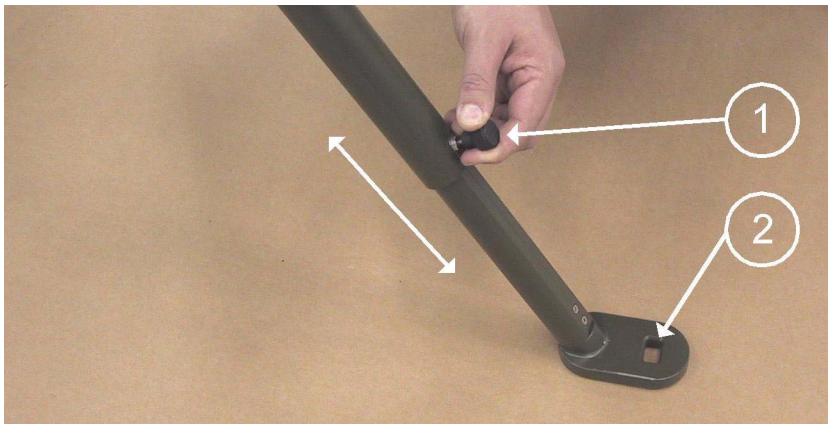

Figure 44 Adjusting Legs

Aligning the Wind Vane

The station has been configured at the factory, in a way that the wind direction reading is automatically correct, when the station is in the northern hemisphere and the solar panel is facing south. In order to restore the factory settings, reset the wind vane alignment with the handheld terminal by giving the value **0** to the **WindC** field in the **Setup** screen.

Table 9 Wind Vane Alignment with Different Station Locations

Station Location	Wind Vane Alignment
Station is in the northern hemisphere and the solar panel is facing south.	Alignment is not needed. Restore the factory settings with the handheld terminal. Give the value **0** to the **WindC** field in the **Setup** screen.
Station is in the southern hemisphere and the solar panel is facing north.	With the handheld terminal, give the value **180** to the **WindC** field in the **Setup** screen.

Operating the Solar Panel

WARNING Photo voltaic modules generate direct current (DC) when exposed to sunlight or other sources of light. Although single modules produce low voltage and current, shocks and burns can still result from contact with the module output wiring. Photo voltaic modules do not have to be connected, that is, powering a load, to generate electricity.

CAUTION Handle the solar panel with care: impact on the front or rear surface can damage the panel. Do not bend the panel.

NOTE Do not concentrate light on the panel in an attempt to increase its power output.

The Solar Power Supply QMP201 has been installed on a tripod leg at the factory. Follow the instructions below to operate the solar panel:

1. Connect the power cable to the **DC Power Input** connector (green arrow) on the upper base of the logger tube.
2. To maximize the annual energy output, tilt the panel at an angle shown in Table 10 on page 53. At some installations, it may be effective to adjust the tilt seasonally. At most latitudes, performance can be improved during the summer by using an angle smaller than the recommendation on the table. Conversely, a larger angle can improve winter performance. The panel must face south in the northern hemisphere and north in the southern hemisphere. Tilt the panel towards the sun: tilt angle should be more vertical the further you are from the equator.

Table 10 Recommended Tilt Angle for the Solar Panel

Latitude of Site	Tilt Angle
0 ...10°	20°
10 ... 50°	Add 10° to the local latitude
> 50°	60°

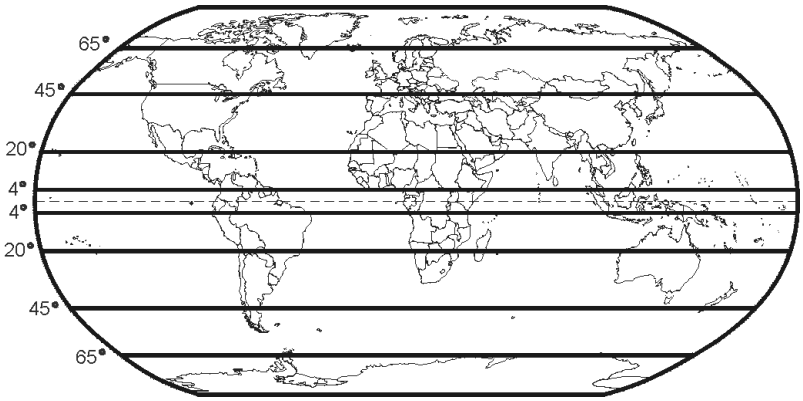

Figure 45 Map of Latitudes

NOTE	The rays of the sun should be perpendicular to the panel, that is, sunlight should hit the panel at a 90° angle.

3. To set the correct tilt angle, slightly loosen the adjustment hand screws on both sides of the unit and tilt the panel. Use the angle adjustment lines on the solar panel, see Figure 46 on page 54. Tighten the bolts when the angle is suitable, refer to Table 10 on page 53.

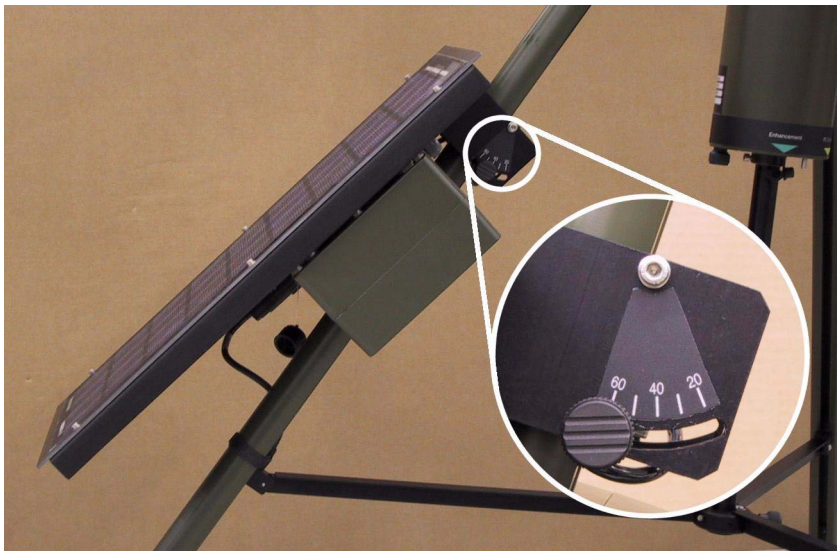

Figure 46 Setting the Correct Tilt Angle

4. Turn on the power supply by switching the battery switch (at the bottom of the power unit) to the ON position.

5. Press the **Status LED** button to check the battery status (green = OK, orange = battery voltage low, red = battery empty).

Operating TACMET MAWS from the AC Power Source

TACMET MAWS can also be operated, and/or the batteries charged, using the AC (mains) power. Connect the AC power cable to the **Mains Input** connector at the bottom of the QMP201 power unit. Secure the cable to the leg with the Velcro belt.

Configuring Radio Modems

Radio modems provide wireless data communication between TACMET MAWS and handheld terminal or between TACMET MAWS and MIDAS IV PC.

You do not need to configure the radio modems, just check that the frequency is correct before installing the radio modem to the sensor arm. The exact UHF frequency of the radio modems is specified in the order phase.

Table 11 on page 55 helps selecting a correct antenna to be used with the radio modem.

Table 11 Antennas to Be Used with the Radio Modem

Frequency	MAWS End Antenna	PC/Handheld End Antenna
UHF 410 ... 430 MHz	QMX101M-1	QMX101M-1
UHF 430 ... 450 MHz	QMX101M-2	QMX101M-2
UHF 450 ... 470 MHz	QMX101M-3	QMX101M-3

WARNING Do not operate the radio modem near electrical blasting caps or in an explosive atmosphere.

CAUTION Do not operate the radio modem unless all RF connectors are secure and any open connectors are properly terminated.

Connecting MIDAS IV PC to TACMET MAWS

Depending on your configuration you have either one or two alternatives for connecting the MIDAS IV PC to TACMET MAWS:

1. Direct hard wire connection
2. Radio frequency (RF) connection, using the optional radio modems

Direct Hard Wire Connection

Connect the landline cable(s) to the **PC Connector** connector on the lower base of the logger tube. The connector is marked with a yellow arrow. Place the MIDAS IV PC in a dry place at the distance defined by the length of the landline cable(s).

Radio Frequency Connection

To enable the radio frequency connection between TACMET MAWS and MIDAS IV PC, you need to connect similarly configured radio modems to TACMET MAWS and to MIDAS IV PC.

NOTE	The radio modem in your system may differ from the one shown in the figures of this section.

1. For connecting a radio modem to TACMET MAWS, see detailed installation information in section Installing Tripod, Sensors, and Optional Antennas on page 45.

NOTE	The antenna must be mounted vertically and placed so that there is a line of sight between antennas.

   a. Install the antenna antenna to the mast of the tripod. For information on which antenna to choose, see Table 11 on page 55.

   b. Install the radio modem to its adapter on the sensor arm.

   c. Connect the antenna cable to the antenna connector on the radio modem.

d. Connect the data/power cable from the radio modem to the TACMET MAWS connector **PC Connector** (marked with a yellow arrow) on the lower base of the logger tube.

e. Confirm by checking the LEDs on the modem that the modem is powered and it is sending and receiving data.

2. For connecting MIDAS IV PC to the radio modem, refer to Figure 47 on page 57.

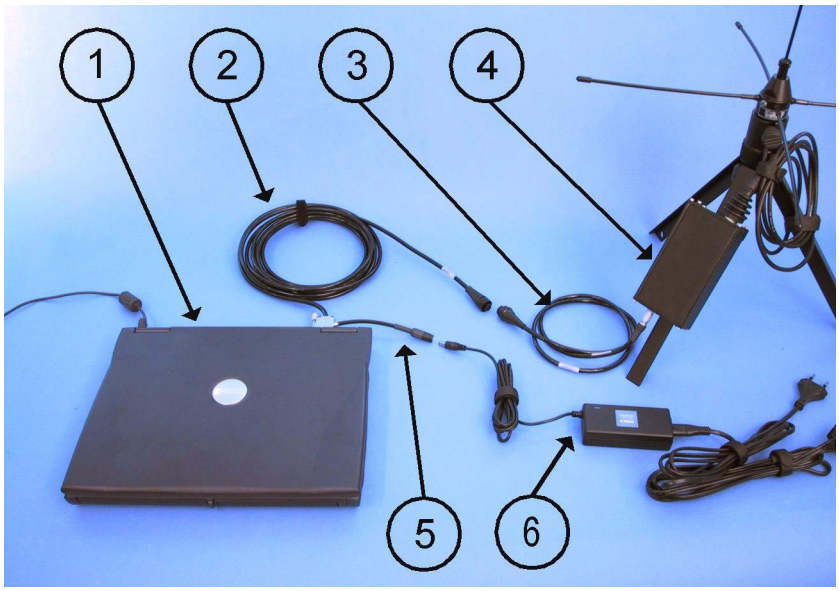

Figure 47 Connecting the Radio Modem to PC

a. Place the correctly configured radio modem (number 4 in Figure 47 on page 57) to the adapter that is mounted on the leg of the tripod.

b. When you install a UHF antenna, install the assembled antenna directly on the top of the tripod, see Figure 48 on page 58.

Figure 48 UHF Antenna on Tripod

c. Connect the antenna cable to the radio modem.

d. Connect the data/power cable (number 3 in Figure 47 on page 57) to the radio modem (4) and the other end to the PC cable (2).

e. Connect the Power Supply Module QMP211 (6) to the power connector (5) of the PC cable and to an AC (mains) outlet.

f. Place the tripod antenna in such a way that there is a line of sight between the antennas.

g. Confirm by checking the LEDs on the bottom of the modem that the modem is powered and it is sending and receiving data.

Connecting the Handheld Terminal to TACMET MAWS

Depending on your configuration you have either one or two alternatives for connecting the handheld terminal to TACMET MAWS:

1. Direct hard wire connection
2. Radio frequency (RF) connection, using optional radio modems

Direct Hard Wire Connection

Connect the handheld terminal cable to the **Hand Terminal** connector on the upper base of the logger tube. The connector is marked with a yellow arrow. When not using the handheld terminal, place the handheld terminal to the leg of the tripod.

NOTE To ensure faultless operation of the handheld terminal, you should remove the handheld terminal from the leg of the tripod and store it indoors in the harsh weather conditions, for example, in cold climate.

Radio Frequency Connection

To enable the radio frequency connection between TACMET MAWS and the Handheld Terminal, you need to connect similarly configured radio modems to TACMET MAWS and to the Handheld Terminal.

NOTE The radio modem in your system may differ from the one shown in the figures of this section.

1. For connecting a radio modem to TACMET MAWS, see detailed installation information in section Installing Tripod, Sensors, and Optional Antennas on page 45.
   a. Install the antenna to the mast of the tripod. For information on which antenna to choose, see Table 11 on page 55.
   b. Install the radio modem to its adapter on the sensor arm.
   c. Connect the antenna cable to the antenna connector on the radio modem.
   d. Connect the data/power cable from the radio modem to the TACMET MAWS connector **Hand terminal** (marked with a yellow arrow) on the upper base.
   e. Confirm by checking the LEDs on the modem that the modem is powered and it is sending and receiving data.

NOTE Lower the protection cover to shield the connectors after you have made all connections.

NOTE	The antenna must be mounted vertically and placed so that there is a line of sight between antennas.

2. For connecting the Handheld Terminal to a radio modem, refer to Figure 49 on page 60.

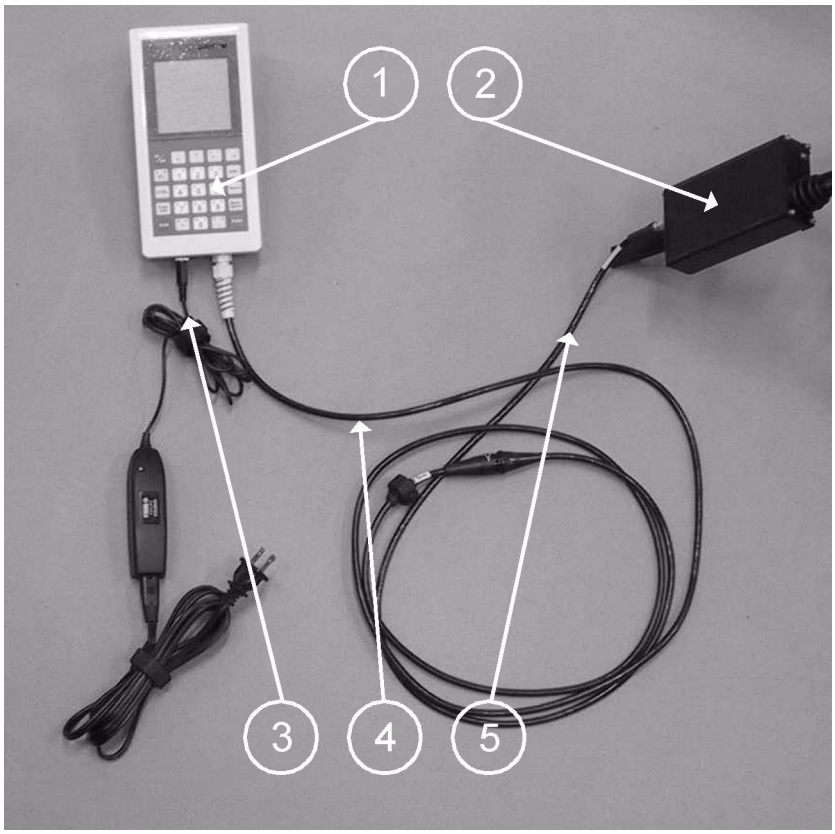

Figure 49 Connecting Radio Modem to the Handheld Terminal

a. Place the correctly configured radio modem to the adapter that is mounted on the leg of the tripod (number 2 in Figure 49 on page 60).

b. When you install a UHF antenna, install the assembled antenna directly on the top of the tripod, see Figure 50 on page 61.

Figure 50 UHF Antenna on Tripod

c. Connect the antenna cable to the radio modem.

d. Connect the data/power cable (4) from the handheld terminal (1) to the radio modem cable (5).

e. Connect the Power Supply Module QMP211 to the power connector on the bottom of the handheld terminal and to an AC outlet (3).

f. Place the tripod antenna in such a way that there is a line of sight between the antennas.

g. Confirm by checking the LEDs on the modem that the modem is powered and it is sending and receiving data.

Enhancement

The Enhancement is packed in two transit cases. Both cases require two persons to lift. Table 12 on page 62 lists the contents of the transit cases for enhancement.

Table 12 Contents of Enhancement Cases

Enhancement	Contents	Dimensions (w × h × l) and weight
QTR104	Ceilometer CT25KAM, ground pegs for CT25KAM, AC and DC cable for CT25KAM, Lightning Detector SA20M, grounding net with pegs for SA20M, SA20M cable	990 × 450 × 400 mm (39.0 × 18.2 × 17.6 in) 30.5 kg (67 lb.)
QTR105	Present Weather Detector PWD11A, Tripod SAT111, Power Supply QMP202, AC (mains) cable for QMP202, enhancement cable	990 × 450 × 400 mm) (39.0 × 18.2 × 17.6 in) 40.9 kg (90 lb.)

Figure 51 Transit Case QTR104 Opened

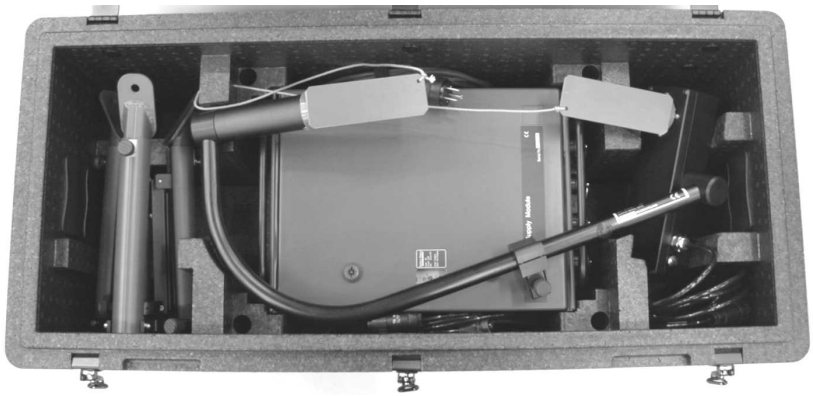

Figure 52 Transit Case QTR105 Opened

The basic system must be set up before the enhancement. See section Basic System on page 42 for instructions on setting up the basic system. After that continue as follows:

1. Select the site for the enhancement sensors.
2. Bring the Mains Power Supply QMP202 to the selected site. QMP202 supplies +12 VDC operating voltage for the TACMET MAWS enhancement sensors.

NOTE	Do not connect the power until the installation is completed.

When AC power (85 ... 264 VAC) is available, connect AC power cable to the **Mains Input** connector on QMP202 and the other end to an AC outlet. In this case, the AC output (AC TO CT25KAM) can be used to power the ceilometer. Check the battery status with the **BTRY Status LED ON** button (see Figure 53 on page 64). Status LEDs can be seen through the window on the cover.

Figure 53 Connectors on the Mains Power Supply QMP202

3. Connect the data cable to the connector **Enhancement** (marked with a green arrow) on the lower base of TACMET MAWS and to the **Connection to MAWS** connector on QMP202.
4. Connect the cables for the enhancement sensors Present Weather Detector PWD11A, Lightning Detector SA20M and Ceilometer CT25KAM and set them up as instructed in the following sections.

Setting up PWD11A

Install the Present Weather Detector PWD11A to the short arm of the TACMET MAWS tripod.

CAUTION	Do not touch the rain detector plate (see arrow on Figure 54 on page 65). Take special care to prevent it from being hit. It is fragile!

NOTE	If the short arm gets loose, use the allen wrench to tighten it.

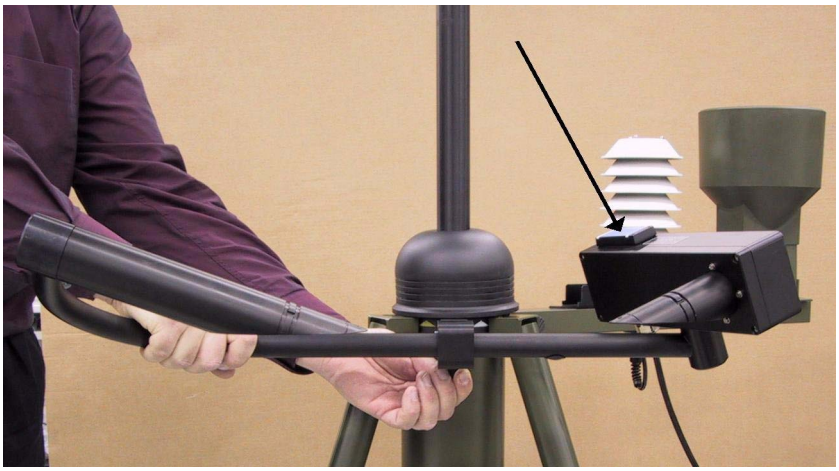

Figure 54 Installing PWD11A (Arrow Pointing to Rain Detector Plate)

1. Remove the protective lens caps and take PWD11A from the transit case.
2. Hold the sensor in a way that the hand screw is facing down.
3. With the hand screw facing the notch, push the sensor in place and tighten the hand screw.
4. Connect the DC power/signal cable to the connector **PWD11A** on the Mains Power Supply QMP202 (see Figure 53 on page 64).
5. Attach the cable to the leg of the tripod with the Velcro belt.

Setting up CT25KAM

CAUTION

1. Open the transit case QTR104. Lift the ceilometer using the handle of the unit and place it horizontally on the transit case as shown in Figure 55 on page 66.

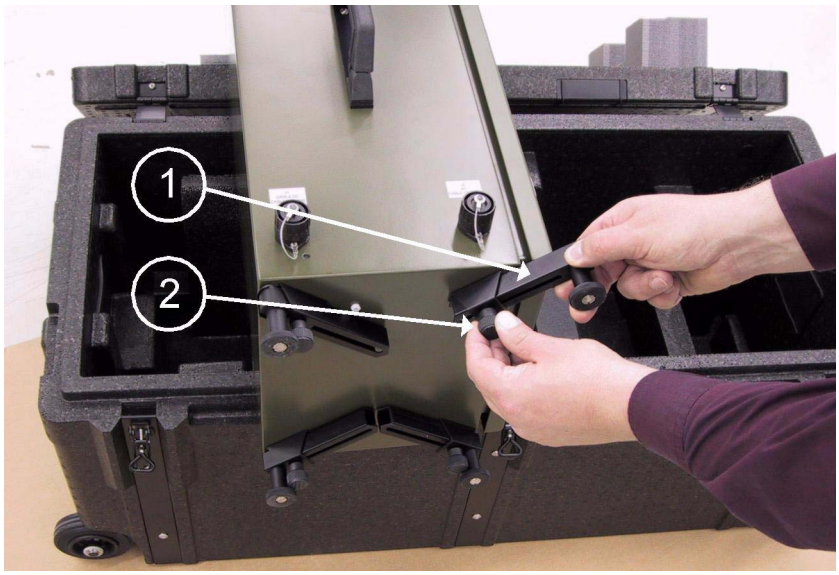

Figure 55 CT25KAM on the Transit Case

2. Open the hand screws (number 2 in Figure 55 on page 66). Widen the legs (1) of the ceilometer. Close the hand screws.
3. Place the ceilometer on the ground in a way that the optical window is directed off the sun. Make sure that the ceilometer stands firmly on the terrain. If not, adjust the vertical adjustment screws of the legs. The unit does not have to be mounted vertically straight, because the unit is equipped with two tilt-angle sensors.

NOTE Ensure the ceilometer is placed in a location so that the data and power connection cables will reach QMP202 before you secure the system with ground pegs.

NOTE Align the ceilometer with the optical window pointing away from the sun (north in the northern hemisphere) to keep excess sunlight from out of the sensor.

4. To secure the ceilometer: insert the pegs next to the legs, and turn the pegs so that the loops are over the legs.
5. Connect the DC/DATA cable to the **J1** connector (number 1 in Figure 56 on page 67) on the ceilometer and the other end to the **CT25KAM** connector on the Mains Power Supply QMP202 (see Figure 53 on page 64).

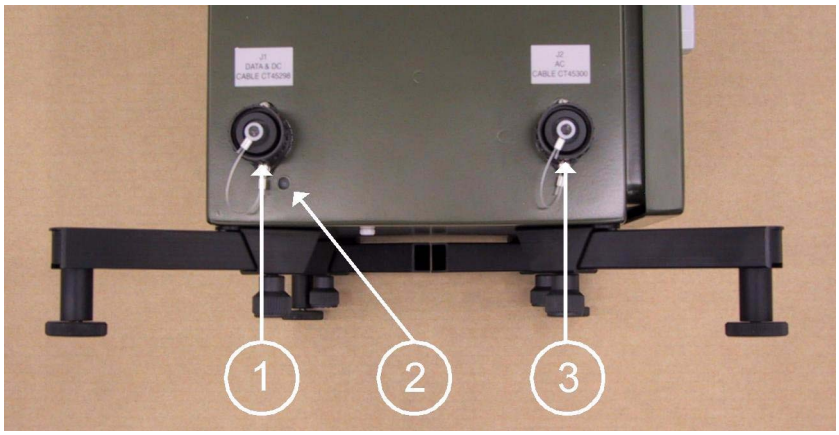

Figure 56 Connectors on Ceilometer CT25KAM

6. Connect the AC cable to the **J2** connector (number 3 in Figure 56 on page 67) on the ceilometer and the other end to the **AC TO CT25KAM** connector on the Mains Power Supply QMP202 (see Figure 53 on page 64).
7. Verify the operation of CT25KAM with the status LED (number 2 in Figure 56 on page 67). For the states of the status LED, see Table 13 on page 67.

Table 13 States of the Status LED

State	Explanation
Red	Only the AC cable is connected.
Green	Only the DATA&DC cable is connected.
Blinking from green to red	Both cables are connected, indicating that the operating voltage and mains power are available.
Red	Both cables are connected and the internal heating is on (likely after start up).

Setting up SA20M

To ensure faultless operation of the lightning detector, place it as far away as possible from other sensors. To gain correct direction information, face the arrow (with N) on the sensor plate to the north with the help of the compass.

1. Connect the DC power/signal cable to the connector (number 1 in Figure 57 on page 68) on SA20M and the other end to the **SA20M** connector on the Mains Power Supply QMP202 (see Figure 53 on page 64).

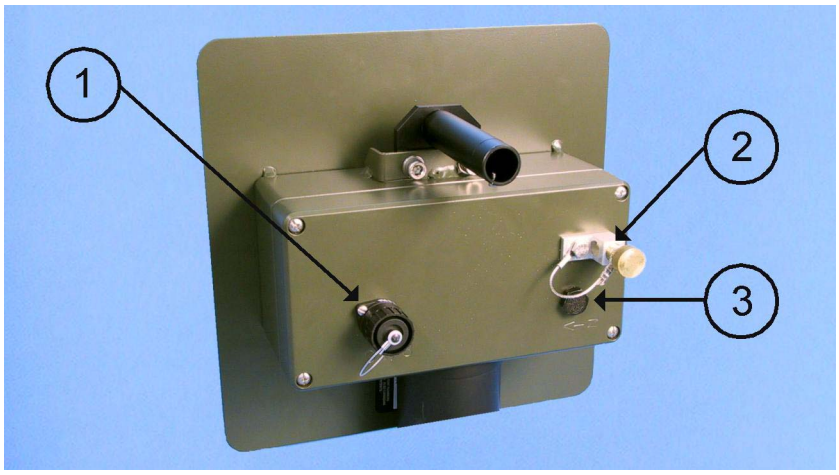

Figure 57 SA20M Unit (Bottom View)

The following numbers refer to Figure 57 on page 68:

1 = DC power/signal cable connector

2 = Grounding net connector

3 = Breather

2. Connect the grounding net cable (number 6 in Figure 58 on page 69) to the earth screw (number 2 in Figure 57 on page 68) on the bottom of SA20M and secure with the finger screw.
3. Open the locking screw (number 3 in Figure 58 on page 69), spread the legs of the tripod and push the support bars (5) all the way down. The support bars should be horizontal. Close the locking screw (3).

Figure 58 Lightning Detector SA20M with Grounding Net

4. Open the hand screw (2) on the tripod (9).
5. Attach the sensor (7) to the tripod and close the hand screw.
6. Open the hand screws on tripod legs (4) and extend the legs.
7. Place the tripod with the lightning detector as far away as possible from TACMET MAWS.
8. Face the arrow (with N) on the sensor plate to the north with the help of the compass.

NOTE	Do not place the compass on top of the unit while aligning, as this will cause erroneous readings.

9. Check with the bubble level (10) that the sensor is leveled.
10. Install the ground pegs (11) through the holes. Using of the ground pegs with the grounding net (6) is essential for getting correct lightning reports.

Disassembly for Transportation

WARNING	Be careful when closing the tripod legs. See that there are no power lines or other obstacles above the mast and wind sensor.

Enhancement

1. Disconnect AC (mains) power from QMP202.
2. Disconnect the mains cable from the **Mains Input** connector of the QMP202.
3. Disconnect all cables from QMP202 and place them in transit cases (see Table 12 on page 62).
4. Replace all protective caps on the QMP202 connectors and other Enhancement connectors.
5. Remove the ground pegs of the tripod SAT111.
6. Disassemble SA20M. Loosen the hand screws on the SAT111 tripod. Place SA20M in the transit case QTR104.
7. Disconnect the SA20M connection cable and place in QTR104.
8. Loosen the locking screw on the support bar and close the tripod. Slide the legs inward and retighten the hand screws. Place tripod in transit case QTR105.
9. Disconnect the data cable from the TACMET MAWS **Enhancement** connector. Place this cable and the QMP202 AC (mains) cable to available openings in QTR105. Place the foam over the tripod and the cables.
10. Loosen the hand screw on the bottom of PWD11A. Pull PWD11A straight out. Place PWD11A in QTR105. Place protective caps on the lenses.
11. Disconnect the cable from the **J1 DATA & DC** connector.
12. Disconnect the cable from the **J2 AC** connector.
13. Lay the ceilometer down with the lens facing away from wind. Retract the legs by loosening the hand screws. Slide the legs inward and tighten the screws. Place ceilometer in QTR104. Store the two ceilometer cables on either side of the ceilometer.

NOTE	Fold handle over on the ceilometer or transit case lid will not close.

Basic System

1. Unplug AC power, if connected. Loosen the hand screws on the solar power supply, turn the solar panel down, and tighten the hand screws. Remove the mains cable from the solar power supply.
2. Raise the protective cover and disconnect the **DC Power Input** connector from TACMET MAWS.
3. Disconnect **Rain** and **Temp./Humidity** connectors. Loosen the two hand screws on the arm. Remove the arm with the rain gauge and the temp./humidity sensor. Place them in transit case QTR101.
4. Depending on your connection method, disconnect handheld display, radio modems, and cables and store them in QTR101. Disconnect antennas and cables. Store UHF antennas in transit case QTR102. Place VHF antennas in transit case QTR101 so that the hook of the bottom antenna is facing down and left and the hook of the upper antenna is facing right and up.
5. Disconnect the **Wind** connector from TACMET MAWS. Release the latch on the telescopic mast. Lower the mast and tighten the latch again.
6. Loosen the telescopic mast locking screw at the base and remove the telescopic mast from the base.
7. Unscrew the plastic collar on the wind sensor.
8. Disconnect the wind sensor cable from the wind sensor. Store the wind sensor in QTR101.
9. Remove the ground pegs.
10. Loosen the hand screw on the bottom of the tripod. Close the tripod and tighten the hand screw. Replace the protective covers on the connectors located on the top and the base of the tube.
11. First, place the tripod to QTR102 with the solar panel facing down. Then place landline cable, antenna, and ground peg bags beside the tripod. Place foam over the tripod. Place the telescopic mast on the foam and close the transit case.

CHAPTER 4
OPERATION

This chapter contains information that is needed to operate TACMET MAWS with the handheld terminal and MIDAS IV software.

Communication Connections

NOTE	Lower the protection cover on top of the tube to shield the connectors after you have made all connections.

There are several options for communication connections:

1. Hard wire connection between TACMET MAWS and the handheld terminal.
   - Connect the handheld terminal cable to the **Hand Terminal** connector (marked with a yellow arrow) on the upper base of TACMET MAWS. See section Handheld Terminal on page 75 for information on using the handheld terminal.
2. Hard wire connection between TACMET MAWS and the MIDAS IV PC.
   - Connect the landline cable(s) between the **PC Connector** connector (marked with a yellow arrow) on the lower base of TACMET MAWS and the MIDAS IV PC. See section MIDAS IV Software on page 91 for information on using the MIDAS IV software.

3. RF connection between TACMET MAWS and the MIDAS IV PC.

   - Connect the PC cable to the radio modem cable. Connect the antenna to the radio modem. Connect the Mains Power Supply QMP211 to the PC cable (on PC end) and to an AC outlet. Connect the TACMET MAWS radio modem to the **PC connector** connector on the lower base of TACMET MAWS. The radio modem is powered by TACMET MAWS. Connect the antenna to the radio modem.

     For information on connecting the radio modem and the antenna to TACMET MAWS, see section Installing Tripod, Sensors, and Optional Antennas on page 45.

4. RF connection between TACMET MAWS and the handheld terminal.

   - Connect the handheld terminal cable to the radio modem cable. Connect the antenna to the radio modem. Connect the Mains Power Supply QMP211 to the handheld terminal and to an AC outlet. Connect the radio modem on TACMET MAWS to the **Hand Terminal** connector on the upper base of the logger tube. The radio modem is powered by TACMET MAWS. Connect the antenna to the radio modem.

     For information on connecting the radio modem and the antenna to TACMET MAWS, see section Installing Tripod, Sensors, and Optional Antennas on page 45.

Handheld Terminal

This section contains information that is needed for using the Handheld Terminal QMD101M.

The handheld terminal provides the following main functions:

- Paged screens for measurement and calculation results produced by the TACMET MAWS logger.
- Alarm screen, that shows active alarms.
- Setup screen for setting up variables such as time and station altitude.

Figure 59 Handheld Terminal

Turning the Terminal On/Off

The terminal is powered by TACMET MAWS. To turn on the terminal, press and release the **On/Off** key. After a few seconds, the terminal shows the **Status** screen. After startup, there might be some error messages. Ignore all of the error messages that come within the first five minutes.

To turn off the terminal, press and hold the **On/Off** key for a second.

Keypad

Shift Key

The alphabetic/numeric **Shift** mode key is used to shift the QMD101M keypad between the alphabetic and numeric modes.

Pressing and releasing the **Shift** key before pressing any other key, places the keypad in either numeric mode (the shift mode indicator displays ↓**a**) or alphabetic mode (the shift mode indicator displays ←**a** or →**a**). Use numeric mode for numbers and symbols (- and .), and alphabetic mode for symbols and letters located in the upper half of the keys.

For example, when the shift mode indicator displays ←**a**, press key **1** to write a letter **C**. To write a letter **D**, change the shift mode to →**a** and press key **1**.

Caps Lock Key

Press the **Caps lock** key to place QMD101M in upper case mode (the shift mode indicator is an upper case "**A**"). While in upper case mode, pressing and releasing the **Shift** key will continue to place QMD101M in and out of alphabetic and numeric modes (the shift mode indicator will change between ↓**A**, ←**A** and →**A**). Press the **Caps lock** key again to place QMD101M in lower case mode.

Function Key F1

NOTE	The terminal mode is for maintenance purposes only.

The function key **F1** can be used to access terminal mode. The terminal mode can only be accessed from the **Setup** screen. The terminal mode is used to communicate with TACMET MAWS using written commands.

Turn the power off and on again to exit the terminal mode.

Cursor Keys

The down and up cursor keys (↓ ↑) are used to move through the various menu screens. The left and right cursor keys (← →) are used to move the cursor to the left and to the right.

Backspace Key

The **Backspace** key deletes the character to the left of the cursor and moves the cursor one step to the left.

Enter Key

The **Enter** key is used to accept information, for example, a command currently entered in an input field. In addition, it is used to scroll through the fields on the **Setup** screen.

Ctrl Key

The **Ctrl** key is used in conjunction with other keys to perform special tasks (see section Status on page 87).

On/Off Key

To turn on QMD101M, press and release the **On/Off** key. To turn off QMD101M, press and hold down the **On/Off** key for a second.

NOTE	At any time, the key sequence **CTRL+ESC** terminates the current function or program and returns control of QMD101M to the FLOS (handheld terminal's embedded software) main menu system. To return to normal display, turn QMD101M off and on again.

Sequence of the Screens

The display has eight different screens in the following order:

1. Main
2. Wind
3. Stat

4. Enh/1
5. Enh/2
6. Alarms
7. Status
8. Setup

Accessing the Screens

The screens are organized in a sequential manner, in the order explained in section Sequence of the Screens on page 77.

The following keys are used for accessing the screens:

- Down arrow ↓ (load next screen)
- Up arrow ↑ (load previous screen)

When you turn the QMD101M power on you will see the **Status** screen (after the **Welcome** screen). Press the ↑ key six times to get the **Main** screen.

Main

MAWS1		Main	13:10*
WD	:	259	Deg
WS	:	12	m/s
T	:	28.0	°C
RH	:	89	%
DT	:	25.0	°C
P	:	29.2	hPa
a	:	0.0	
p	:	0.0	hPa
QFE	:	29.3	hPa
QFF	:	1	hPa
QNH	:	0.2	hPa
PA	:	0.0	m
DA	:	0.0	m
↓a‖		↓=Next	

Figure 60 Main Screen

The **Main** screen shows the key values of the standard measurements and calculations.

Table 14 Main Screen Information

Screen text	Measurement	Unit SI (US)	Note
MAWS1			Station name
Main			Screen name
13:10			Current time
*			The handheld terminal receives data when the asterisk is seen.
WD	Wind direction	Deg	
WS	Wind speed	m/s (kt)	
T	Air temperature	°C (°F)	
RH	Relative humidity	%	
DT	Dew point	°C (°F)	
P	Barometric pressure	hPa (inHg)	
a	Pressure tendency	code 0 ... 8	Available after 3 hours
p	Pressure trend (3 h)	hPa (inHg)	Available after 3 hours
QFE	Field pressure	hPa (inHg)	
QFF	Sea-level pressure	hPa (inHg)	
QNH	Altimeter setting	hPa (inHg)	Available after 5 minutes
PA	Pressure altitude	m (ft.)	
DA	Density altitude	m (ft.)	

Wind

Press ↓ on the **Main** screen to get to the **Wind** screen.

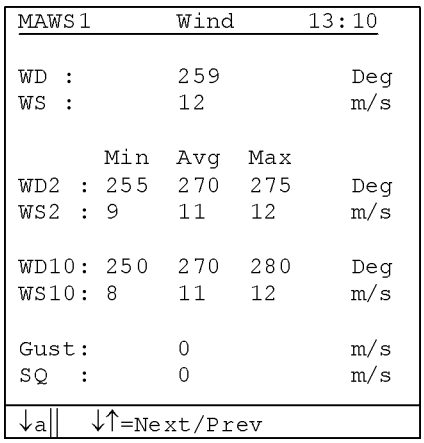
MAWS1 Wind 13:10
WD : 259 Deg
WS : 12 m/s
Min Avg Max
WD2 : 255 270 275 Deg
WS2 : 9 11 12 m/s
WD10: 250 270 280 Deg
WS10: 8 11 12 m/s
Gust: 0 m/s
SQ : 0 m/s
↓a|| ↓↑=Next/Prev

Figure 61 Wind Screen

The **Wind** screen shows instant and statistical wind information.

Table 15 Wind Screen Information

Screen label	Measurement	Unit SI (US)
WD	Wind direction	Deg
WS	Wind speed	m/s (kt)
Min	Minimum values	
Avg	Average values	
Max	Maximum values	
WD2	Wind direction, 2-minute values	Deg
WS2	Wind speed, 2-minute values	m/s (kt)
WD10	Wind direction, 10-minute values	Deg
WS10	Wind speed, 10-minute values	m/s (kt)
Gust	Wind gust speed	m/s (kt)
SQ	Wind squall speed	m/s (kt)

Statistics

Press ↓ on the **Wind** screen to get to the **Statistics** screen.

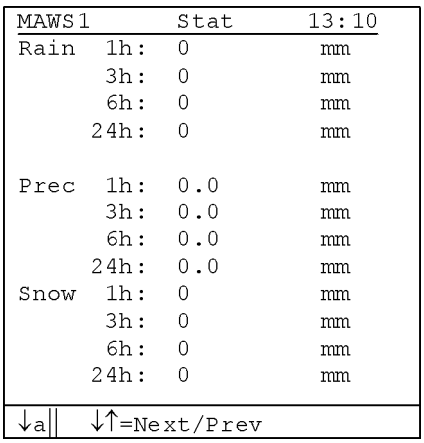

Figure 62 Statistics Screen

The **Statistics** screen shows statistic values of liquid and solid precipitation.

Table 16 Statistics Screen Information

Screen label	Measurement	Unit SI (US)
Rain 1h	Last one-hour floating precipitation sum from QMR101M	mm (in)
Rain 3h	Last three-hour precipitation sum from QMR101M	mm (in)
Rain 6h	Last six-hour precipitation sum from QMR101M	mm (in)
Rain 24h	24-hour precipitation sum from QMR101M (starting at 00:00 am)	mm (in)
Prec 1h	Last one-hour precipitation sum from PWD11A	mm (in)
Prec 3h	Last three-hour precipitation sum from PWD11A	mm (in)
Prec 6h	Last six-hour precipitation sum from PWD11A	mm (in)
Prec 24h	Last 24-hour precipitation sum from PWD11A	mm (in)
Snow 1h	Last one-hour snow sum from PWD11A	mm (in)
Snow 3h	Last three-hour snow sum from PWD11A	mm (in)
Snow 6h	Last six-hour snow sum from PWD11A	mm (in)
Snow 24h	Last 24-hour snow sum from PWD11A	mm (in)

Precipitation statistics (water and snow sums) are synchronized to UTC. Reset times for statistics are shown in Table 17 on page 82.

Table 17 Reset Times for Precipitation Statistics

Statistic	Reset Times
3 h	02:55, 05:55, 08:55, 11:55, 14:55, 17:55, 20:55, and 23:55
6h	05:55, 11:55, 17:55, and 23:55
24h	11:55

NOTE If precipitation is snow, Prec 1h to 24h values show the liquid equivalent and Snow 1h to 24h values show the snow thickness. The values are updated once per hour.

Enh/1

Press ↓ on the **Statistics** screen to get to the **Enh/1** screen (the first Enhancement screen).

```
MAWS1      Enh/1       13:10
Condition: Mist


METAR PW : BR

Prec. Int: 0.1          mm/h


Lightning 15 min:
Count    : 2
Nearest  : 2            km
Bearing  : 170          deg
RfNoise  : N
↓a‖   ↓↑=Next/Prev
```

Figure 63 Enhancement Screen 1

Table 18 Enhancement Screen 1 Information

Screen Label	Measurement	Unit SI (US)
Condition	Textual representation of the present weather code from PWD11A. Table 19 on page 83 lists present weather codes.	
METAR PW	METAR message present weather code (see Table 29 on page 100 and Table 30 on page 101).	
Prec. Int.	Precipitation intensity from PWD11A	mm/h (in/h)
Lightning 15 min	Last 15 min lightning values	
Count	Number of lightning strikes in 15 minutes	/min
Nearest	Distance to nearest lightning strike	km (sm)
Bearing	Direction to nearest lightning strike	deg
RfNoise	SA20M skinmap information: **N** (None), **L** (Low), **M** (Medium), and **H** (High).	

Table 19 SYNOP Codes Used by PWD11A (Number Codes Not Seen on QMD101M)

PW Code	Textual Representation
00	Clear
04	Haze or smoke (vis ≥ 1 km)
05	Haze or smoke (vis < 1 km)
10	Mist
20	Fog [1]
21	Precipitation [1]
23	Rain (not freezing) [1]
24	Snow [1]
25	Freezing rain or freezing drizzle
30	Fog [2]
31	Fog or ice fog, in patches [2]
32	Fog or ice fog, has become thinner during past hour [2]
33	Fog or ice fog, no appreciable change during past hour [2]
34	Fog or ice fog, has begun or become thicker during past hour [2]
40	Precipitation
41	Precipitation, slight or moderate
42	Precipitation, heavy
50	Drizzle
51	Drizzle, not freezing, light
52	Drizzle, not freezing, moderate
53	Drizzle, not freezing, heavy
54	Drizzle, freezing, light
55	Drizzle, freezing, moderate

Table 19 SYNOP Codes Used by PWD11A (Number Codes Not Seen on QMD101M) (Continued)

PW Code	Textual Representation
56	Drizzle, freezing, heavy
60	Rain
61	Rain, light
62	Rain, moderate
63	Rain, heavy
64	Rain, freezing, light
65	Rain, freezing, moderate
66	Rain, freezing, heavy
67	Rain (or drizzle) and snow, light
68	Rain (or drizzle) and snow, moderate or heavy
70	Snow
71	Snow, light
72	Snow, moderate
73	Snow, heavy
74	Ice pellets, light
75	Ice pellets, moderate
76	Ice pellets, heavy
80	Showers or intermittent precipitation
81	Rain showers, light
82	Rain showers, moderate
83	Rain showers, heavy
84	Rain showers, violent
85	Snow showers, light
86	Snow showers, moderate
87	Snow showers, heavy
90	Thunderstorm
91	Thunderstorm, slight or moderate, no precipitation
92	Thunderstorm, slight or moderate, rain/snow
94	Thunderstorm, heavy, no precipitation
95	Thunderstorm, heavy, rain/snow

1. Codes are used if precipitation or fog was observed during the preceding hour but not at the time of observation.
2. Codes are used if precipitation or fog is observed at the time of observation.

Enh/2

Press ↓ on the **Enh/1** screen (the first Enhancement screen) to get to the **Enh/2** screen (the second Enhancement screen):

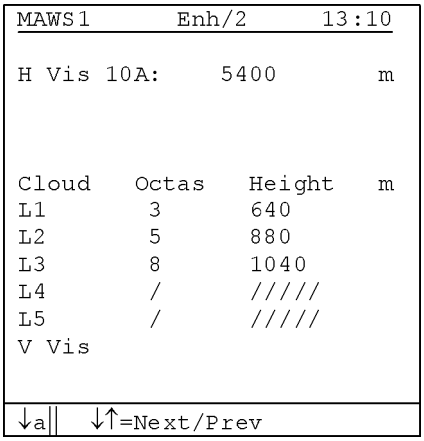

Figure 64 Enhancement Screen 2

NOTE Vertical visibility (V Vis) is available only when the sky is clear of clouds. If any clouds are detected, the vertical visibility measurement is not available.

Table 20 Enhancement Screen 2 Information

Screen Label	Measurement	Unit SI (US)
H Vis 10A	10-minute average horizontal visibility measured by PWD11A	m (sm)
Cloud	Cloud bases L1 to L5. L1 is the lowest cloud base.	
Octas	Sky condition categories.	1 to 8 octas
Height	Height of the cloud base.	m (ft.)
/////	The cloud base does not exist.	
V Vis	Vertical visibility measured by CT25KAM.	m (ft.)

Alarms

Press ↓ on the **Enh/2** screen to get to the **Alarms** screen:

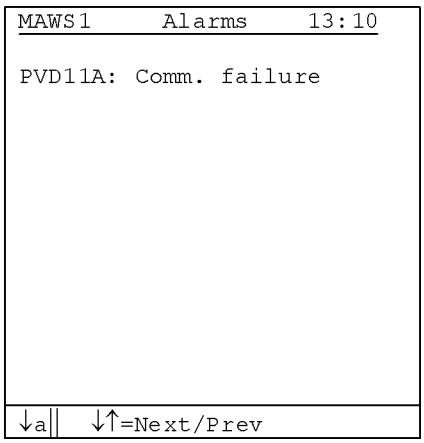

Figure 65 Alarms Screen

The **Alarms** screen shows active alarms. If an alarm is triggered, the **Alarms** screen will appear automatically. Press **ESC** key to return to the previous screen, or press **Enter** to acknowledge the alarm message.

Table 21 List of Possible Alarms

Alarm	Explanation and Possible Remedy
AC (mains): Off	QMP202MP is not connected to AC outlet.
BASIC: Battery low	QMP201 battery low. Connect TACMET MAWS to an AC outlet.
CT25KAM: Comm. failure	Communication failure. Verify correct cable connections or replace sensor.
CT25KAM: HW alarm/warning	Hardware error on CT25KAM.
CT25KAM: Optics contamin.	CT25KAM optics contaminated. Clean the optics.
ENH: Battery low	QMP202 battery low. Connect QMP202 to an AC outlet.
MAINS: Off	QMP201 is not connected to an AC outlet.
PMT16: Air press. misg.	Air pressure value missing. Not user serviceable.
PWD11A: Comm. failure	Communication failure. Verify correct cable connections or replace sensor. QMP202(MP) battery empty or hardware failure.
PWD11A: HW alarm/warning	Hardware error on PWD11A.
PWD11A: Optics contamin.	PWD11A optics contaminated. Clean the optics.

Table 21 List of Possible Alarms (Continued)

Alarm	Explanation and Possible Remedy
QMD101M: Comm. failure	Communication failure. Verify correct cable connections or replace handheld terminal.
QMH101M: Air temp. misg.	Air temperature value missing. Verify correct cable connections or replace sensor.
QMH101M: Humidity misg.	Humidity value missing. Verify correct cable connections or replace sensor.
QMP202MP: Battery low	QMP202MP battery low. Connect QMP202MP to an AC outlet.
QMR101M: Rain gauge misg.	Rain gauge missing. Verify cable connections.
SA-20: Comm. failure	Communication failure. Verify correct cable connections or replace sensor.
SA-20: HW alarm/warning	Hardware error on SA20M.
SA-20: Skinmap rate high	Too much electrical interference. Remove interfering equipment.
WMS302M: Wind dir. misg.	Wind direction value missing. Verify correct cable connections or replace sensor.
WS425: Wind dir. misg.	Wind direction value missing. Verify correct cable connections or replace sensor.

Status

Press ↓ on **Alarms** screen to get to the **Status** screen:

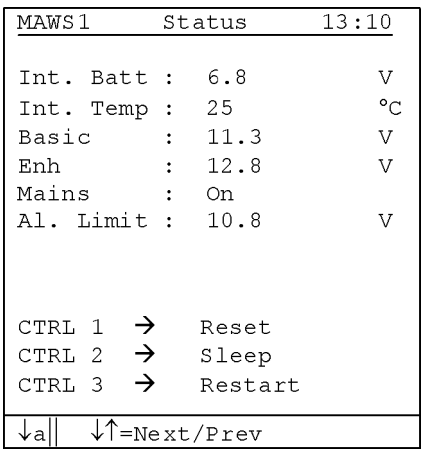

Figure 66 Status Screen

The **Status** screen shows voltage information and internal temperature of the TACMET MAWS logger. In the **Status** screen you may also reset

TACMET MAWS, set TACMET MAWS into sleep mode, or restart TACMET MAWS from sleep mode.

Table 22 Status Screen Information

Screen label	Explanation	Limit value
Int. Batt	Internal battery voltage of MAWS (V)	5.5 ... 7.6 V
Int. Temp	Internal temperature of MAWS (°C or °F)	-40 ... +80 °C -40 ... +176 °F
Basic	Battery voltage of QMP201 (V)	10 ... 16 V
Enh	Battery voltage of QMP202 (V)	10 ... 16 V
Mains	AC power to MAWS (On/Off)	
Al. Limit	MAWS sends an alarm to the handheld terminal when the voltage of the batteries drops below the set limit.	
CTRL 1	Press CTRL+1 to reset TACMET MAWS	
CTRL 2	Press CTRL+2 to put TACMET MAWS into sleep mode. TACMET MAWS wakes up when you connect the handheld terminal and turn it on.	
CTRL 3	Press CTRL+3 to restart TACMET MAWS from sleep mode.	

Setup

Press ↓ on the **Status** screen to get to the **Setup** screen.

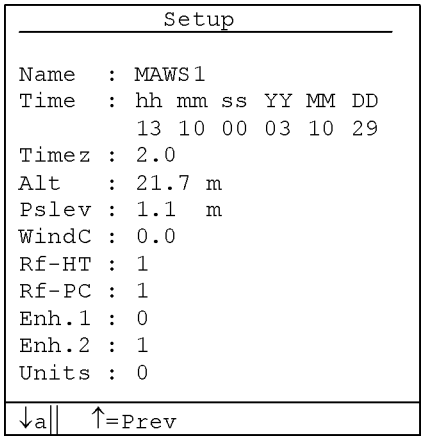

Figure 67 Setup Screen

NOTE When taking TACMET MAWS into use for the first time or upon connecting the battery, the station dependent settings must be checked. All the settings (excluding Name) are mandatory.

NOTE When changing the station dependent settings, connect the handheld terminal to TACMET MAWS with a hard wire.

To change the station dependent settings do as follows:

1. Press **Enter** to move to the desired field.
2. When the cursor is on the desired field, press **Space** to open the input field.
3. Wait until the square brackets appear and type a value (use shift modes as explained in section Shift Key on page 76).
4. After typing a value, press **Enter** to accept the new value. If you do not type a new value and you press **Enter** the value remains unchanged.
5. Reset the station (see section Status on page 87) after you have changed station dependent settings.

NOTE If you are not able to get the input field, it means that there is a communication problem between TACMET MAWS and the handheld terminal. See section troubleshooting the Handheld Terminal on page 75.

Table 23 Station Dependent Settings

Screen label	Setting
Name	Enter a desired station name (max. 8 characters). The station name is a static parameter and will remain after power off.
Time	Time and date. Set the time according to the example. To set only the time, type for example 13 15 00 (hh mm ss).
Timez	Time zone sets the time difference from UTC. For example, enter -5 in the eastern USA (New York, for example). For details, see Figure 68 on page 90.
Alt	Station altitude from sea level. Use the same unit as selected in the **Units** field.
Pslev	Pressure sensor altitude from the ground (station level). Use the same unit as selected in the **Units** field.

Table 23 Station Dependent Settings (Continued)

Screen label	Setting
WindC	Wind direction calibration to align the wind vane (360=north). The value on the screen is the offset.
Rf-HT	Not applicable, leave as is.
Rf-PC	Not applicable, leave as is.
Enh.1	Should always be set to 0.
Enh.2	Enhancement sensors included in configuration. 0 = Not included, 1 = Included.
Units	Display unit: 0 = SI units, 1 = US units. Display unit will change when a value is logged the next time.

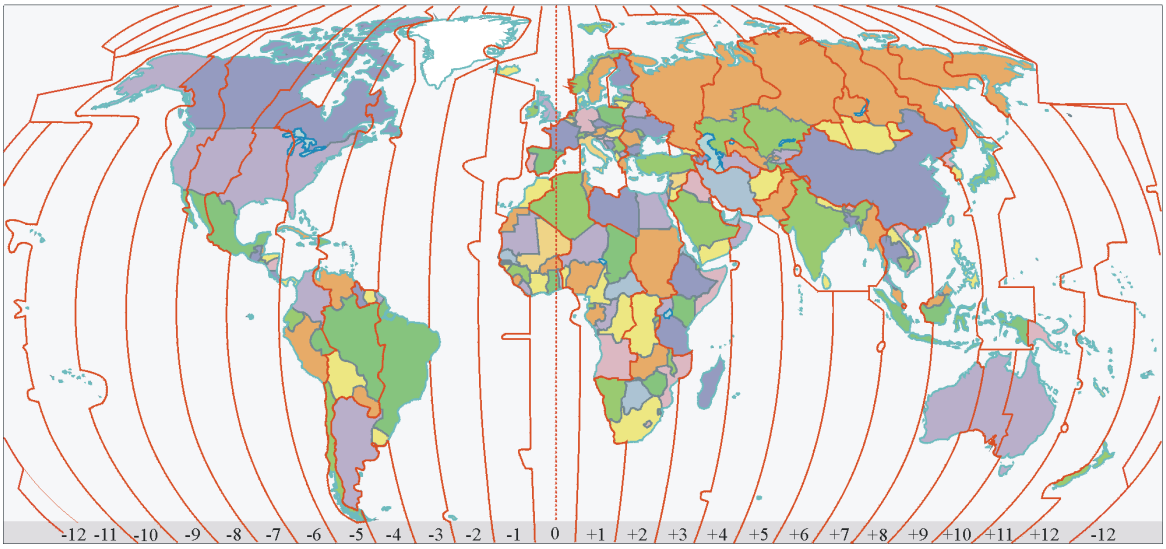

Figure 68 Time Zones

Terminal Mode

NOTE	The terminal mode is for maintenance purposes only.

When you are on the **Setup** screen, press **F1** to start a terminal connection.

To close the terminal connection, turn the power off and on again.

MIDAS IV Software

This section includes detailed information on operating TACMET MAWS with the MIDAS IV software.

The MIDAS IV software collects measured and calculated data from the TACMET MAWS systems. In addition, it automatically generates METAR reports, archives data for 30 days on the hard disk or any other selected storage media, and distributes data further to other systems. MIDAS IV allows the user to edit the METAR reports with easy-to-use templates. Moreover, MIDAS IV provides Event Monitor option, with with which the operator can monitor the system and sensor alarms.

The MIDAS IV data can be accessed through four workstation applications. These applications are:

- **Weather View** for data display
- **US METAR Template** for sending a METAR/SPECI message
- **Event Monitor** for viewing and acknowledging events
- **ASCII Log View** for viewing stored history data

MIDAS IV TACMET Installation

Minimum system requirements for the MIDAS IV PC are listed in Table 24 on page 91.

Table 24 Minimum System Requirements

Component	Minimum Requirement
PC	500 MHz
Operating system	Windows® 2000[1]
Memory	128 MB RAM
Hard disk space	200 MB[2]
File system	NTFS
Drives	CD-ROM drive
Serial ports	1 to 3 free serial ports
System time	GMT/UTC time

1. Microsoft® Windows® 2000 Professional operating system with service pack 4.
2. Minimum installation requires 50 MB hard disk space.

NOTE Usually you do not need to install the MIDAS IV software, as it is already installed at Vaisala. When the MIDAS IV software is launched in the Windows startup automatically, you can proceed to section MIDAS IV TACMET Configuration Wizard on page 93.

To install MIDAS IV Software and all the necessary accessories, follow the procedure below:

1. Start the MIDAS IV PC and log in as Administrator, or with the profile having equivalent rights.
2. Check that the system uses GMT/UTC time. You can set the time in **Start - Settings - Control Panel - Date/Time - Time Zone** by selecting **(GMT) Casablanca, Monrovia**.
3. Check that the file system of the C:\ drive is NTFS with **Start - Settings - Control Panel -Administrative Tools - Computer Management - Storage - Disk Management**. If it is FAT file system, you will need to convert it to NTFS. In the **Start** menu, click **Run** and type **convert** *c: /FS:NTFS*.
4. Check with **Start - Settings - Control Panel - Administrative Tools - Services and Applications - Services** that your computer has TCP/IP protocol installed. The MIDAS IV software will not function without TCP/IP.
5. Turn off the Plug and Play service. Go to **Start - Settings - Control Panel - Administrative Tools - Services and Applications - Services**. Select **Plug and Play**, right-click it and select **Properties**. In **Startup type**, select **Disabled**, and click the **OK** button.
6. Run the Installation Wizard from a CD drive (e: is assumed as a CD drive) **e:\setup.exe**. Double-click the file to run it. Follow the instructions on the screen and click **Next** in all prompts.
7. Click **Finish** to complete the setup and restart the computer. After the installation is finished, you will have new shortcuts on the desktop: **Configuration Wizard**, **Weather View**, **Event Monitor**, **MIDAS IV Tacmet**, and **METAR Template**. These will also be located under **Start - Programs - MIDASIV Tacmet**.

Disabling/Enabling MIDAS IV

By default MIDAS IV is automatically started in reboot of the computer after installation.

To disable MIDAS IV, that is, to stop the services and to prevent the automatic startup at reboot, select **Start - Programs - Midas IV Tacmet - Disable MIDAS IV**.

To enable automatic startup of MIDAS IV again, select **Start - Programs - Midas IV Tacmet - Enable MIDAS IV**.

Uninstalling MIDAS IV

In case you need to uninstall MIDAS IV, select **Start - Programs - Midas IV Tacmet - Uninstall MIDAS IV**.

MIDAS IV TACMET Configuration Wizard

Double-click the **Configuration Wizard** icon on the desktop to open the Configuration Wizard application.

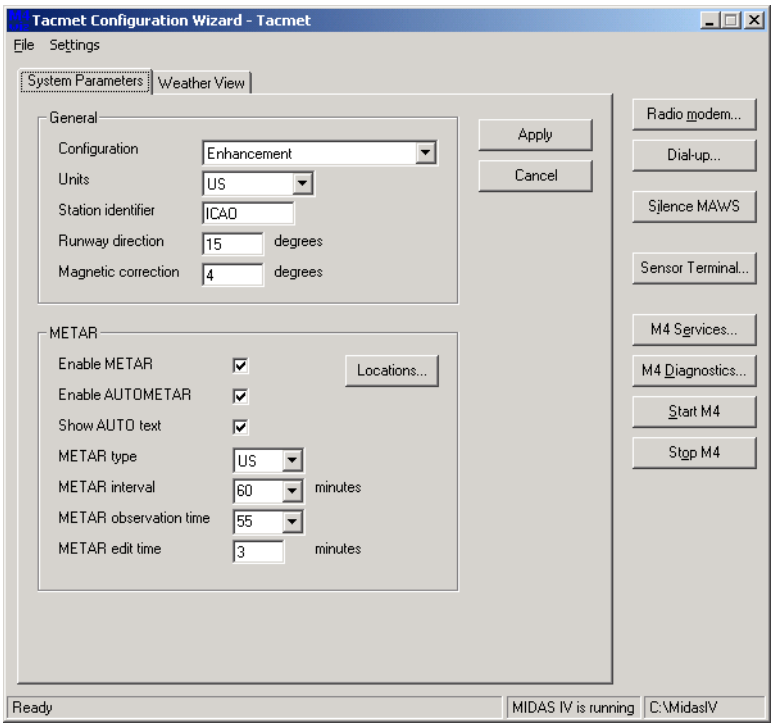

Figure 69 Configuration Wizard

The Configuration Wizard includes two menus: **File** and **Settings**. From the **File** menu, you can browse log files, exit Configuration Wizard, or read the version information. The **Settings** menu has two menu items: **Radio modem** and **Dial-up**.

The **Radio modem** sub-menu has three items: **Use radio modem**, **Radio modem channel**, and **Configuration software**. **Use radio modem** -item is used to enable/disable radio modem. **Radio modem channel** -item is used to select the pre-configured radio channel. **Configuration software** -item is used to select an application for configuring the radio modem.

The optional **Dial-up** sub-menu has two items: **Use Dial-up** and **Configuration software**. **Use Dial-up**-item is used to enable/disable dial-up connection, for example, satellite connection. **Configuration software** -item is used to select an application for configuration of the dial-up connection.

Table 25 on page 94 lists the Configuration Wizard buttons.

Table 25 Configuration Wizard Buttons

Button	Explanation
Radio Modem	Opens the Radio Modem Configuration program
Dial-up	Opens optional Dial-up Manager
Silence MAWS Enable MAWS	Silences MAWS Asks which radio channel to use and then enables MAWS
Sensor Terminal	Opens Sensor Terminal application, NOTE! Only for advanced use!
M4 Services	Opens MIDAS IV Service Manager, NOTE! Only for advanced use!
M4 Diagnostics	Opens Diagnostics Monitor (see section Diagnostic Monitor on page 121)
Start M4	Starts MIDAS IV applications
Stop M4	Stops MIDAS IV applications
Apply	Accepts configuration changes
Cancel	Cancels configuration changes
Locations...	Opens METAR/MET REPORT Manager application (see section METAR/MET REPORT Manager on page 109)

System Parameters Tab

From the **System Parameters** tab (see Figure 69 on page 93), you can configure the parameters described in Table 26 on page 95.

Table 26 Description of System Parameters Tab

Item	Description
Configuration	Select your system configuration: 1 Basic station, 1 Enhancement station, Basic and Basic stations, Enhancement and Basic stations, Enhancement and Enhancement stations, or Fixed Station (mast installation).
Units	Select the units you want to use: SI or US
Station identifier	The unique ICAO identifier with 4 characters when the METAR message is sent to AFTN. Otherwise, give the station ID, for example, airfield name.
Runway direction	Give the Runway direction in degrees, for example, 20
Magnetic correction	Give the difference between magnetic north and true north
Enable METAR	Check only if you want the system to generate METAR/SPECI messages
Enable AUTOMETAR	Check only if you want to enable automatic METAR/SPECI sending feature
Show AUTO text	Check only if you want the AUTO text to appear in the header of METAR/SPECI message
METAR type	Select METAR/SPECI type: US or ICAO
METAR interval	Select METAR/SPECI sending interval in minutes: 30 or 60
METAR observation time	Select METAR/SPECI editing start time: 00, 05, 10, 15, 20, 25, 30, 35, 40, 45, 50, or 55 minutes past the hour
METAR edit time	Select the desired METAR/SPECI editing time in minutes, for example 3.

Weather View Tab

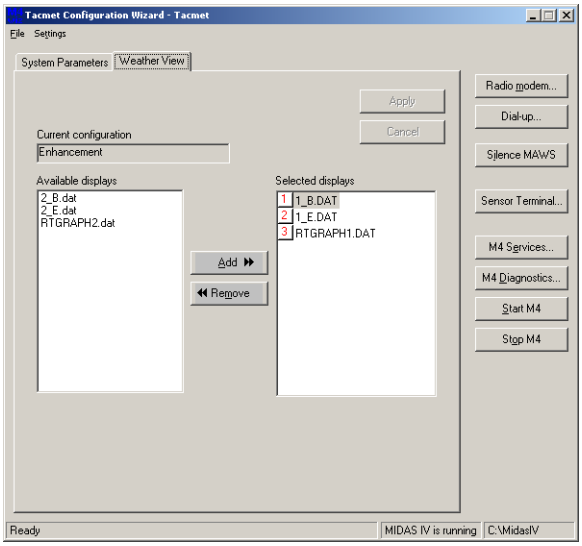

Figure 70 Weather View Tab

With the **Weather View** tab, you can configure the amount and the order of the displays in the Weather View application.

NOTE	Normally there is no need to modify the display settings.

Weather View

Weather View is an application for graphical and numerical presentation of the TACMET MAWS values. The application updates real-time values constantly as the system receives new data from the sensors.

NOTE	The number, content, and order of the screens depends on the configuration of your system and may differ from the ones presented in this manual. The order of the screens can be configured with the Configuration Wizard.

Basic System Data

The Weather View application is composed of several screens. When one TACMET MAWS is connected to MIDAS IV PC, the screen 1 shows basic system data. When two stations are connected, screen 1 shows basic system data from TACMET MAWS 1 and screen 2 from TACMET MAWS 2. The screens 1 and 2 are similar.

NOTE	The values marked with a red color after a startup are updated after 10 minutes.

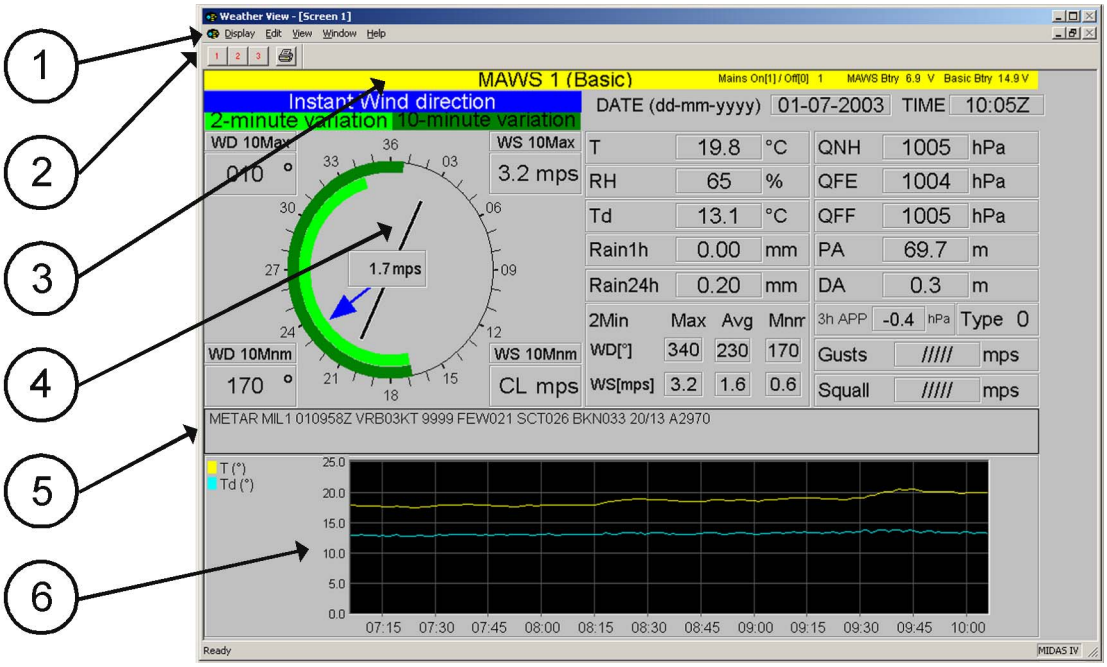

Figure 71 Weather View Screen: Basic System Data

The following numbers refer to Figure 71 on page 97:

1 = Menu bar

2 = Toolbar

3 = Title of the screen

4 = Wind rose: Runway direction

5 = Last sent METAR/SPECI report

6 = Graphical display

Table 27 Parameters in Basic Screen

Field	Description
MAWS 1 (Basic), or TACMET MAST	Weather station identification
Mains ON/OFF	AC power to MAWS (ON [1] / OFF [0])
MAWS Btry	Internal battery voltage of MAWS (V)
Basic Btry, or	Battery voltage of QMP201 (V)
DC Voltage	Battery voltage of QMP202MP (V)
DATE	Current date
TIME	Current time
Runway direction	Black line shows runway direction
Instant Wind direction	Blue arrow shows instant wind direction

Table 27 Parameters in Basic Screen (Continued)

Field	Description
2-minute variation	Light green area shows 2-minute variation
10-minute variation	Dark green area shows 10-minute variation
WD 10Max	Shows 10-minute wind direction maximum
WS 10Max	Shows 10-minute wind speed maximum
Rectangle in the middle of wind rose	Shows instant wind speed value
WD 10Mnm	Shows 10-minute wind direction minimum
WS 10Mnm	Shows 10-minute wind speed minimum
T	Air temperature
RH	Relative humidity
Td	Dew point
Rain 1h	1-hour precipitation value (QMR101M)
Rain 24h	24-hour precipitation value (QMR101M)
Max	Maximum wind values (2-min)
Avg	Average wind values (2-min)
Mnm	Minimum wind values (2-min)
WD	Wind direction
WS	Wind speed
QNH	Altimeter setting
QFE	Station pressure
QFF	Sea-level pressure
PA	Pressure altitude
DA	Density altitude
3h App	Pressure trend (3-hour difference)
Type	Pressure type 0 ... 8
Gusts	Shows gusts speed
Squall	Shows squall speed

Follow the instructions in section Changing Graphic Scales on page 103 to change the scales of the temperature diagram.

Enhancement System Data

Data screen for Enhancement shows data from the enhancement sensors of TACMET MAWS.

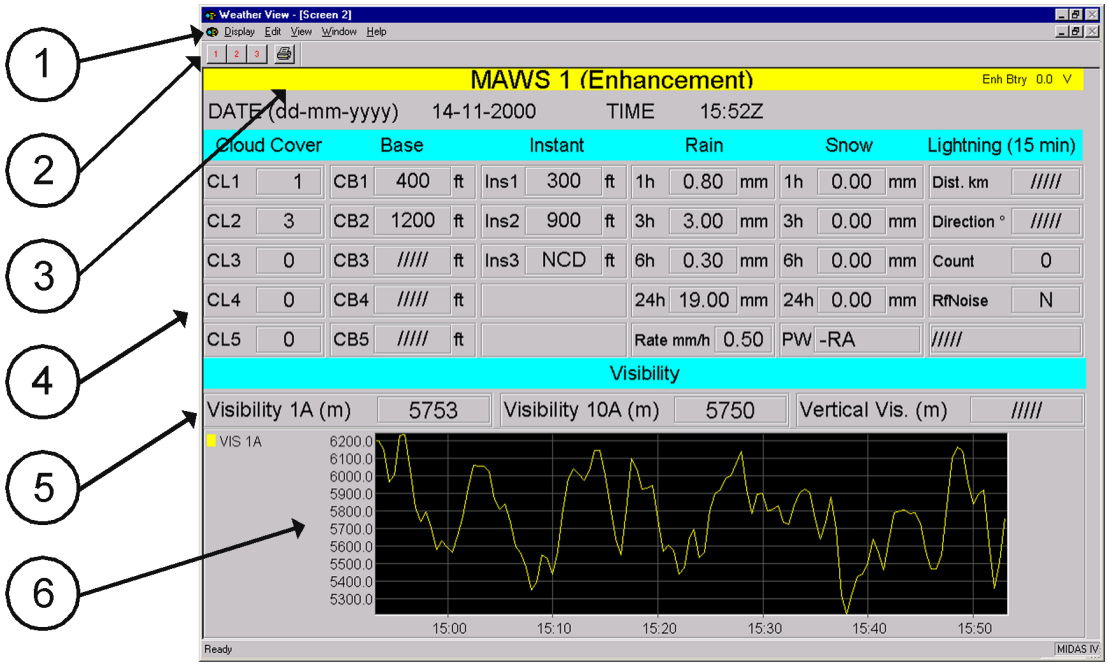

Figure 72 Weather View Screen: Enhancement Data

The following numbers refer to Figure 72 on page 99:

1 = Menu bar

2 = Toolbar

3 = Title of the screen

4 = Values of the cloud, rain, snow, and lightning data

5 = Visibility values

6 = Graphical display of the visibility

NOTE If lightning values show slashes (/////), check the cable connections of the Lightning Detector SA20M.

Table 28 Parameters in Enhancement Data Screen

Field	Description
MAWS 1 (Enhancement), or TACMET MAST	Weather station identification
Enh Btry	Battery voltage of QMP202 (V). Not available in all configurations.
DATE	Current date
TIME	Current time
Cloud Cover and Base	Cloud covers CL1 to CL5 and cloud bases CB1 to CB5.
CL1 ... CL5	CL1 is the lowest cloud base (unit is Octa).
CB1 ... CB5	Height of the cloud base.
Ins1 ... Ins3	Instant cloud hits measured by CT25KAM. Not available in all configurations.
Rain	Precipitation values from PWD11A
1h ... 24h	Last 1 (and 3, 6, 24) -hour precipitation sum
Rate	Rain intensity
Snow	SNOW values from PWD11A
1h ... 24 h	Last 1 (and 3, 6, 24) -hour snow sum
PW	Present weather code (see Table 29 on page 100 and Table 30 on page 101)
Lightning (15 min)	Lightning values (last 15 minutes)
Distance	Distance to nearest lightning strike
Direction °	Direction to nearest lightning strike
Count	Number of lightning strikes in 15 minutes
RfNoise	SA20M skinmap information: N (None), L (Low), M (Medium), and H (High)
Visibility 1A	1-minute average visibility values
Visibility 10A	10-minute average visibility values
Vertical Vis.	Vertical visibility measured by CT25KAM. Not available in all configurations.

Table 29 Present Weather Codes (Qualifiers)

Intensity	Descriptor
Light (-) [1]	BC Patches [1]
Moderate (no qualifier) [1]	SH Showers [1]
Heavy (+)[1]	TS Thunderstorm [2]
VC In the vicinity [2]	FZ Freezing [1]

1. Codes from the PWD11A sensor
2. Codes generated by TACMET MAWS using data also from other sensors than PWD11A

Table 30 Present Weather Codes (Phenomena)

Precipitation [1]	Obscuration	Other
DZ Drizzle	BR Mist [1]	SQ Squalls [2]
RA Rain	FG Fog [1]	
SN Snow	DU Widespread dust [1]	
IC Ice crystals	HZ Haze or dust [3]	
PL Ice pellets		

1. Codes from the PWD11A sensor
2. Codes generated by TACMET MAWS using data also from other sensors than PWD11A
3. Codes generated using PWD11A and TACMET MAWS data

If present weather information does not exist, this group is omitted.

Example

-RA: "Light rain"

Follow the instructions in section Changing Graphic Scales on page 103 to change the scale of the diagram.

Graphic Display

Graphic display shows pressure, cloud base, and wind speed data.

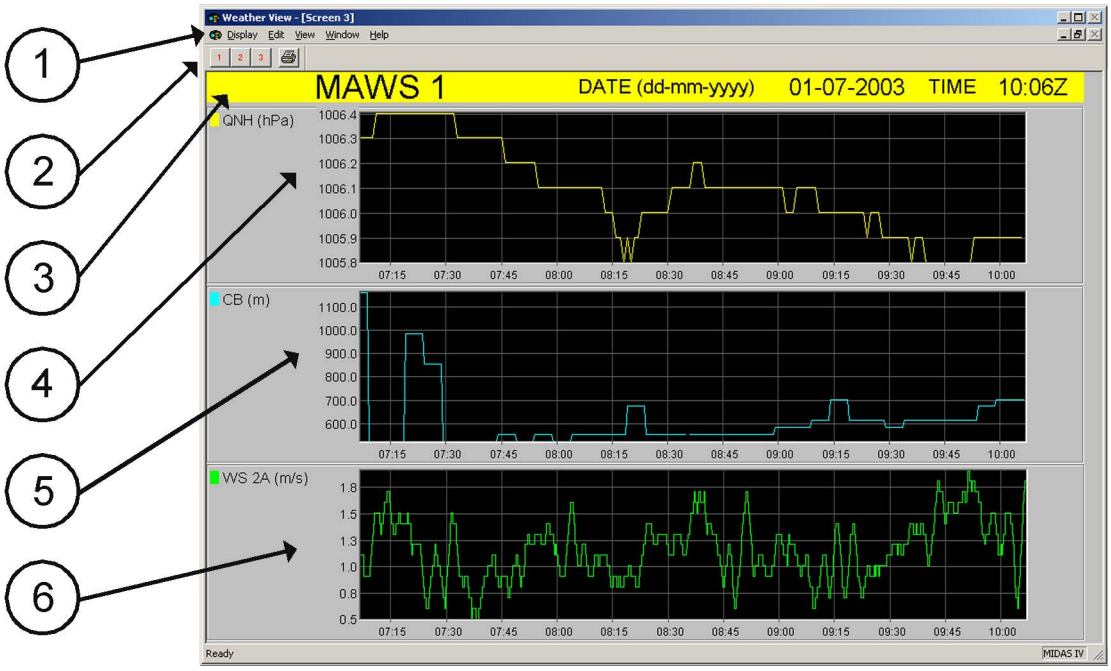

Figure 73 Weather View Screen: Graphic Display

The following numbers refer to Figure 73 on page 102:

1 = Menu bar

2 = Toolbar

3 = Title of the screen

4 = QNH (altimeter setting) graph

5 = Cloud base graph

6 = Wind speed 2-minute average graph

Table 31 Parameters in Graphic Display

Field	Description
MAWS 1, or TACMET MAST	Weather station identification
DATE	Current date
TIME	Current time
QNH	Altimeter setting
CB	Cloud base
WS 2A	Wind speed 2-minute average

Follow the instructions in section Changing Graphic Scales on page 103 to change the scales of the diagrams.

Changing Graphic Scales

To change the scale of a diagram (for example temperature diagram in screen 1), do the following:

1. Move the cursor over the temperature diagram.
2. Click the right mouse button.
3. Change the scales as desired (see Figure 74 on page 103) and click **OK**.

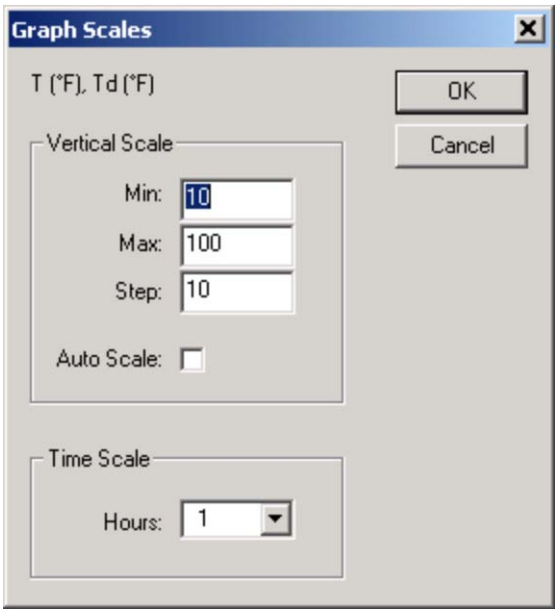

Figure 74 Changing the Scales

Menu Options

The Weather View application contains five menus: **Display**, **Edit**, **View**, **Window**, and **Help**.

1. The **Display** menu contains the following options:
   - **Screen 1 to 3** displays a Weather View screen
   - **Refresh** updates all display items

- **Open** displays the screen description files
- **Close** shuts the active window
- **Print** prints the data shown on the active display
- **Print Setup** displays printer and connection options

2. The **Edit** menu contains the following command:
   - **Copy As Bitmap** copies the current display to the clipboard as bitmap picture
3. The **View** menu contains the following commands:
   - **Toolbar** shows/hides the toolbar
   - **Status Bar** shows/hides the status bar
4. The **Window** menu contains the following commands:
   - **Arrange Icons** arranges icons of minimized windows
   - **Close All** closes all open windows
   - **Screen 1 to 3** displays a Weather View screen
5. The **Help** menu includes the following command:
   - **About Weather View** shows version and copyright information.

Toolbar

The toolbar contains shortcut icons for the most frequently used menu options. See Table 32 on page 104.

Table 32 Event Monitor Toolbar Buttons

Button	Name and Description
	Screen 1 opens the first Weather View screen (Basic data)
	Screen 2 opens the second Weather View screen (Enhancement data)
	Screen 3 opens the third Weather View screen (Graphical view)
	Print prints the active screen.

Status Bar

The status bar (at the bottom of the screen) displays information on the current state of the application.

METAR/SPECI Template

The METAR/SPECI template (referred to as US METAR Template or generally as METAR Template) generates a METAR observation report at the intervals specified in the system configuration. Sensor data is automatically updated onto the template. The observation follows the format specified by WMO. The observations can be edited or augmented by the operator and are not distributed until approved by the operator. Special observations are generated when weather parameters reach the threshold specified in the system configuration and as required by ICAO Annex III. There is also support for corrected and retarded messages.

The template window (see Figure 75 on page 106) appears on your screen when it is time to send a METAR/SPECI report. This window is also displayed when you open the application yourself. The template is similar for both METAR and SPECI reports; the only difference is the **TYPE** field.

METAR/SPECI service starts automatically at system startup. When you do not need to use the application, you can minimize the window.

NOTE	The thresholds listed in Table 33 on page 106 are country specific and must be confirmed.

Table 33 Thresholds That Initiate Automatic SPECI Report

Measured Parameter	Threshold
Wind direction	60 deg
Wind speed	5 m/s (9.7 kt)
Gust	5 m/s (9.7 kt)
Air pressure	Changes by 0.3 hPa (0.01 inHg) from the previous METAR
Cloud layer	When a cloud layer with an octa of 5 ... 8 (BKN/OVC) goes below 100 ft. (30.48 m) 200 ft. (61 m), 300 ft. (91 m) 500 ft. (152 m), 700 ft. (213 m) 1000 ft. (305 m), 1500 ft. (457 m), or 3000 ft. (914 m)
Vertical visibility	When the visibility goes below: 100 ft. (30 m), 200 ft. (61 m) 300 ft. (91 m), 500 ft. (152 m) 700 ft. (213 m), 1000 ft. (305 m), or 1500 ft. (457 m)

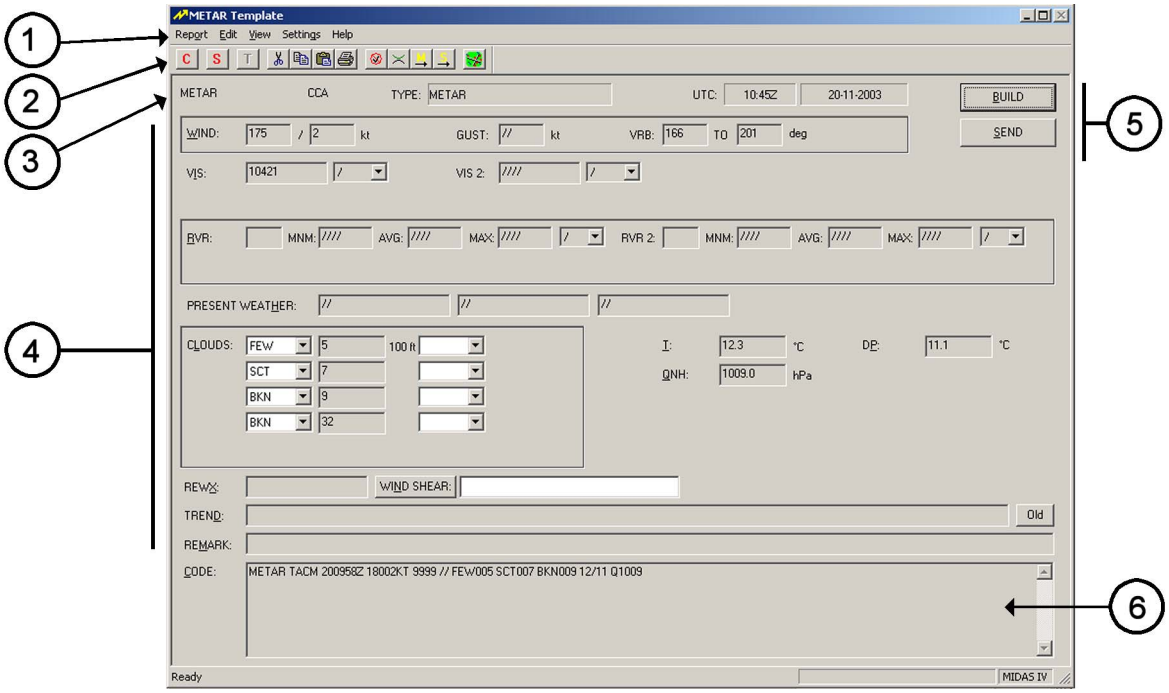
1
2
3
4
5
6
METAR Template
Report Edit View Settings Help
METAR CCA TYPE: METAR UTC: 10:45Z 20-11-2003 BUILD
WIND: 175 / 2 kt GUST: // kt VRB: 166 TO 201 deg SEND
VIS: 10421 VIS 2: ////
RVR: MNM: //// AVG: //// MAX: //// RVR 2: MNM: //// AVG: //// MAX: ////
PRESENT WEATHER: // // //
CLOUDS: FEW 5 100 ft
SCT 7
BKN 9
BKN 32
T: 12.3 °C DP: 11.1 °C
QNH: 1009.0 hPa
REWX: WIND SHEAR:
TREND: Old
REMARK:
CODE: METAR TACM 200958Z 18002KT 9999 // FEW005 SCT007 BKN009 12/11 Q1009
Ready
MIDAS IV

Figure 75 METAR (SPECI) Template

The following numbers refer to Figure 75 on page 106:

1 = Menu bar

2 = Toolbar

3 = Report identification data

4 = Data fields

5 = Buttons for building and sending the report

6 = **CODE** field for the coded report

The buttons in the METAR template are described in Table 34 on page 107.

Table 34 Buttons in METAR Template

Button	Description
BUILD	Builds and validates the report
SEND	Saves the report to hard disk, or sends the report to the external interface
WIND SHEAR	Opens the **Wind Shear Data** window for selecting the runways with wind shear
Old	Enters the previous TREND in the **TREND** field

The METAR Template functions can be selected from the menu bar. The typical menus and menu commands are presented in the following tables. Depending on the system configuration, all options may not be available.

Table 35 METAR Template: Report Menu

Command	Description
BUILD	Builds and validates the report
TREND	Sends a TREND request to Forecaster
SEND	Saves the report to hard disk, or sends the report to the external interface
CORR	Displays a template for a corrected METAR with the data from the previously sent METAR report filled in.
SPECI	Displays a new SPECI template for editing
Print	Prints the template screenshot
Print Preview	Displays the preview of the print
Print Setup	Opens a window for changing the printer and paper settings

Table 36 METAR Template: Edit Menu

Command	Description
Undo	Cancels the last action
Cut	Removes the selected text
Copy	Copies the selected text
Paste	Adds the copied or cut text at the cursor location
Copy to Clipboard	Copies the template as a bitmap image to the Clipboard

Table 37 METAR Template: View Menu

Command	Description
Toolbar	Shows/hides the toolbar
Status bar	Shows/hides the status bar

Table 38 METAR Template: Settings Menu

Command	Description
Automated METAR	Turns the automated METAR function on: the system sends the METAR report without user intervention.
Automated SPECI	Turns the automated SPECI function on; the system sends the SPECI reports without user intervention.
Minimize After Send	Minimizes the template to the task bar after the report has been sent.
No consistency check	Turns the consistency check off. When selected, the system does not display validation error messages when building the report.
Trend field from observer	Defines that observer provides the TREND forecast.
METAR/MET REPORT Manager	Opens the METAR/MET REPORT Manager application.
Select font	Opens a window for changing the font used in data fields.

Table 39 METAR Template: Help Menu

Command	Description
About METAR/ MET REPORT Template	Displays software version and copyright information

The METAR/MET REPORT toolbar typically contains the buttons described in Table 40 on page 109. Depending on the system configuration, some options may not be available.

Table 40 METAR Template: Toolbar Buttons

Button	Name and Description
	CORRECTED displays a template for a corrected METAR with the data from the previously sent METAR filled in.
	SPECI displays a new SPECI template for editing.
	Request TREND sends a TREND request to Forecaster.
	Cut removes the selected text.
	Copy copies the selected text.
	Paste adds the copied or cut text at the cursor location.
	Print prints the template.
	No consistency check, turns the consistency check off. When selected, the system does not display validation error messages when building the report.
	Trend field from observer, defines that observer provides the TREND report.
	Automated METAR, turns the automated METAR function on; the system sends the METAR reports without user intervention.
	Automated SPECI, turns the automated SPECI function on; the system sends the SPECI reports without user intervention.
	METAR/MET REPORT Manager, opens the application for defining the source of data in the data fields.

METAR/MET REPORT Manager

With the METAR/MET REPORT Manager, you can define the measurement site from which US METAR template data comes. If you choose, for example, **MAWS1**, the data comes automatically from MAWS1 to the US METAR template. If you choose **manual**, you have to add the value manually to the US METAR template.

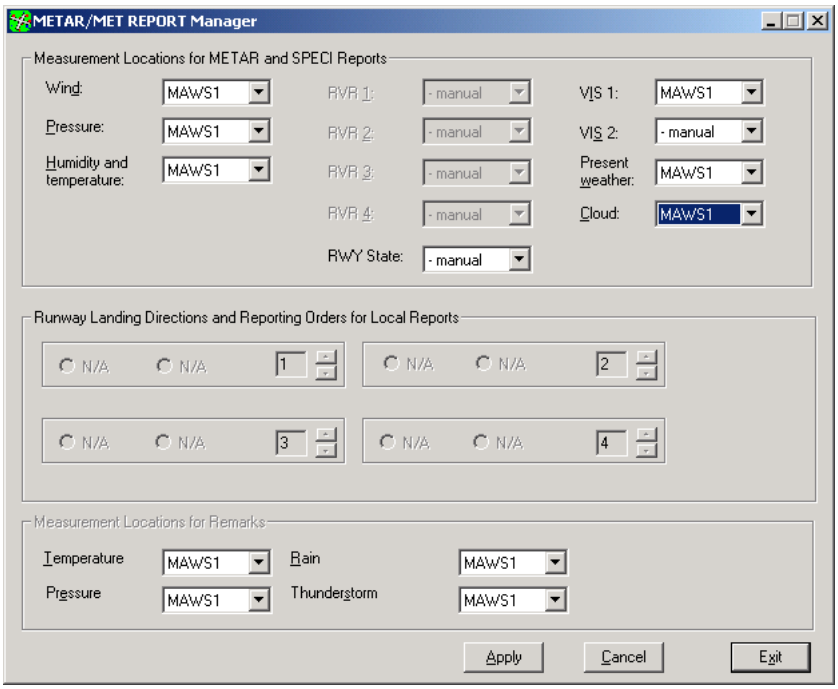

Figure 76 METAR/MET REPORT Manager

METAR/SPECI Editing Procedure

The steps of producing a METAR/SPECI report are:

- Checking and editing data fields
- Adding remarks
- Building the report
- Sending the report.

Checking and Editing Data Fields

When the **METAR template** window appears on your screen, several fields are already filled with sensor data. These fields are called automatic data fields, because the system automatically fills them in for you.

The template also includes manual data fields. They are called manual because they are not filled in automatically. You need to fill them yourself by clicking the field and entering the value. When the template appears, the manual fields have slashes (////) in them or they are empty.

To be able to notice a problem situation in the system, it is important to understand which fields are automatic and which are manual. Table 41 on page 111 lists automatic and manual fields and the special conditions related to them.

Table 41 Fields in METAR/SPECI Template

Parameter	Automatic/ Manual	Comment
WIND, 1st field	Automatic	Wind direction in degrees.
WIND, 2nd field	Automatic	Wind speed in m/s or knots.
GUST	Automatic	Maximum wind speed during the last 10 minutes.
VRB, 1st field	Automatic	Lower limit of wind direction variation in degrees during the last 10 minutes
VRB, 2nd field	Automatic	Upper limit of wind direction variation in degrees during the last 10 minutes
VIS, value	Automatic	Visibility, 10-minute average from the selected site
VIS, direction code	Manual	Direction of visibility (N, NE, E, SE, S, SW, W, NW, /)
VIS 2, value	Manual	Visibility, 10-minute average from the selected site
VIS 2, direction code	Manual	Direction of visibility (N, NE, E, SE, S, SW, W, NW, /)
RVR fields	Manual	Runway Visual Range: minimum, average, maximum, tendency.
RVR 2 fields	Manual	Runway Visual Range: minimum, average, maximum, tendency.
PRESENT WEATHER, 1st field	Automatic	Automatic value from PWD11A.
PRESENT WEATHER, 2nd field	Manual	Second present weather code
PRESENT WEATHER, 3rd field	Manual	Third present weather code
CLOUDS, 1st row, 1st field	SKC and VV automatic, other values manual.	Cloud amount (VV, SKC, FEW, SCT, BKN, OVC).
CLOUDS, 1st row, 2nd field	Automatic	Cloud height in meters, feet, or hundreds of feet.
CLOUDS, 1st row, 3rd field	Manual	Cloud type (CB, TCU)
CLOUDS, all other rows	Manual	Like the fields in the first row of the Clouds group, except the cloud amount options are: FEW, SCT, BKN, OVC. The 1st row is for the lowest cloud layer, the last row for the highest layer.
T	Automatic	Temperature in Celsius degrees.
DP	Automatic	Dew point in Celsius degrees.
QNH	Automatic	Pressure reduced to the mean sea level in hectopascals or inHg.
REWX	Manual	Recent weather code.

Table 41 Fields in METAR/SPECI Template (Continued)

Parameter	Automatic/ Manual	Comment
WIND SHEAR	Manual	Wind shear alerting system is not a standard part of the system, so this is a manual field.
TREND	Automatic	The field is a special data field.
REMARK	Manual	The field is for additional information.
CODE	Automatic	Shows the data to be sent

NOTE Slashes in manual fields are normal. When you see slashes in manual fields, enter data in the field.

Adding Remarks

You can add remarks to the METAR report whenever necessary. A remark is any comment you consider important; it could be related, for example, to runway conditions.

Building the Report

Build the report by clicking the **BUILD** button. The system validates the report. If the system displays error messages, do one of the following:

- If you click **Yes**, the report is built. Some data may be marked with slashes.
- If you click **No**, the system does not continue building the report. You can correct the values in the data fields and click the BUILD button again.

When you click the **BUILD** button, the system performs a set of validations, depending on the configuration. The system checks that certain values, for example, temperature, dew point, and pressure fall within the normal range.

The system also checks that present weather codes and numeric data are consistent and that you have entered cloud amount data together with the cloud height data.

If the values are valid, the system builds the report and you can send it. If the system finds invalid values, it informs you about them with error messages.

CAUTION	If the **No consistency check** option in the **Settings** menu is selected, the system does not display the error messages. Instead, it replaces the incorrect values by slashes in the final report code.

The system displays the final report text in the **CODE** field. Check the report code. If there are errors in the code, correct the values in the template data fields and click **BUILD** again.

Sending the Report

When you have built the report and made sure that the text in the **CODE** field is OK, you can send the report by clicking the **SEND** button. The system adds the abbreviated header lines automatically in the beginning of the report and sends it. If the **Minimize after send** option is selected from the **Settings** menu, the system automatically minimizes the template window.

ASCII Log View

MIDAS IV stores METAR history files for a period of 30 days. After that, they are automatically erased from the folder. The files are stored in the C:\MIDASIV\HISTORY\.

You can open the history files with the ASCII Log View application as follows:

1. Open the **MIDAS IV Tacmet** folder on the desktop.
2. Double-click the **ASCII Log View** icon.
3. To open the history files, select **Open** in the **File** menu, and browse to C:\MIDASIV\HISTORY\. For the history file names, refer to Table 42 on page 114.

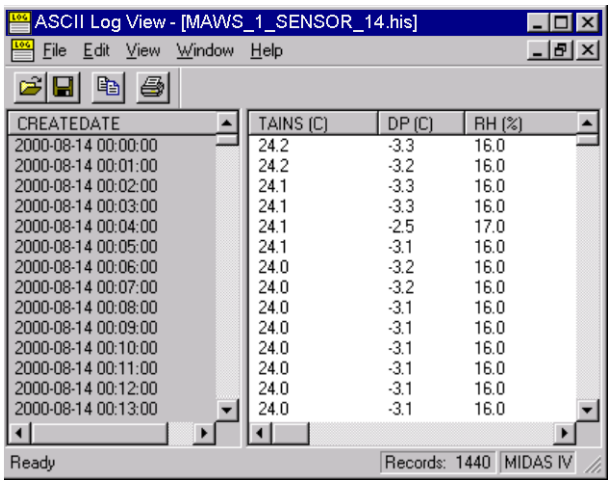

Figure 77 ASCII Log View

Table 42 History File Names and Content

Stored data	File name	Explanation
Weather parameters	x_SENSOR_date	Data from all MAWS x (1 or 2) sensors.
	x_THUNDER_date	Data from SA20M sensors
Events	EVENTS_1.HIS	Data from the 1st day of the month.
METAR/SPECI reports	REPORTS_1.HIS	Data from reports sent in the 1st day of the month.

Table 43 History File Column Indicators

Column	Explanation [unit]
BASE1 ... BASE5	1st ... 5th cloud base [m]
CH1INS	1st cloud height [m]
COUNT15, COUNT60	Lightning count within last 15 or 60 min.
CREATEDATE	Date and time when the data is logged.
DA	Density altitude [m]
DIRNEAREST	Nearest lightning direction [Deg]
DP	Dew point [°C]
OCTA1 ...OCTA5	1st ... 5th octa [Octa]
MOR_10A	10 minute average visibility
MOR_10M	10 minute minimum visibility
MOR_10X	10 minute maximum visibility
PA	Pressure altitude [m]
PAINS	1-minute barometric pressure average [hPa].
PTEND	Pressure tendency [hPa]
PTREND	Pressure trend (3-hour difference) [hPa]
PW1	METAR present weather code 1 by PWD11A
PW2	METAR present weather code 2 by PWD11A

Table 43 History File Column Indicators (Continued)

Column	Explanation [unit]
PW3	METAR present weather code 3 by PWD11A
PWTXT	METAR present weather text by PWD11A and SA20M
QFE	Field level pressure [hPa]
QFF	Sea level pressure [hPa]
QNH	Altimeter setting [hPa]
RAIN_SUM1H	1-hour rain sum [mm] by QMR101M
RAIN_SUM3H	3-hour rain sum [mm] by QMR101M
RAIN_SUM6H	6-hour rain sum [mm] by QMR101M
RAIN_SUM24H	24-hour rain sum [mm] by QMR101M
RANGENEAREST	Nearest lightning range [km]
RATE	Precipitation rate
RAW_MESSAGE	SA20M raw message
RH	1-minute relative humidity average [%].
SKINMAP	Electrical interference
SNOW_SUM1H	1-hour snow sum [mm]
SNOW_SUM3H	3-hour snow sum [mm]
SNOW_SUM6H	6-hour snow sum [mm]
SNOW_SUM24H	24-hour snow sum [mm]
TAINS	1-minute temperature average [°C].
THUNDER_REMARK	METAR present weather code by SA20M
VERVIS	Vertical visibility
VISINS	Instant visibility [m]
WATER_SUM1H	1-hour water sum [mm] by PWD11A
WATER_SUM3H	3-hour water sum [mm] by PWD11A
WATER_SUM6H	6-hour water sum [mm] by PWD11A
WATER_SUM24H	24-hour water sum [mm] by PWD11A
WD2A	2-minute wind direction average [Deg]
WD10M	10-minute wind direction minimum [Deg]
WD10A	10-minute wind direction average [Deg]
WD10X	10-minute wind direction maximum [Deg]
WIND_SQUALL	Wind squall
WS2A	2-minute wind speed average [m/s]
WS10A	10-minute wind speed average [m/s]
WS10M	10-minute wind speed minimum [m/s]
WS10X	10-minute wind speed maximum [m/s]
WSGUST	Wind gust

Event Monitor

Event Monitor is an application for viewing and acknowledging events, warnings, and alarms in the system.

Events are divided into three categories: operational, technical, and internal events. Operational events are notifications about changed meteorological conditions. Technical events are related to the functioning of the sensors and to the communication between the sensors and MIDAS IV Computer. Internal Events concern the internal operation of the system, normally the operation of the system services.

The system creates an event when technical or meteorological conditions change.

Double-click the **Event Monitor** icon on the desktop to open the Event Monitor.

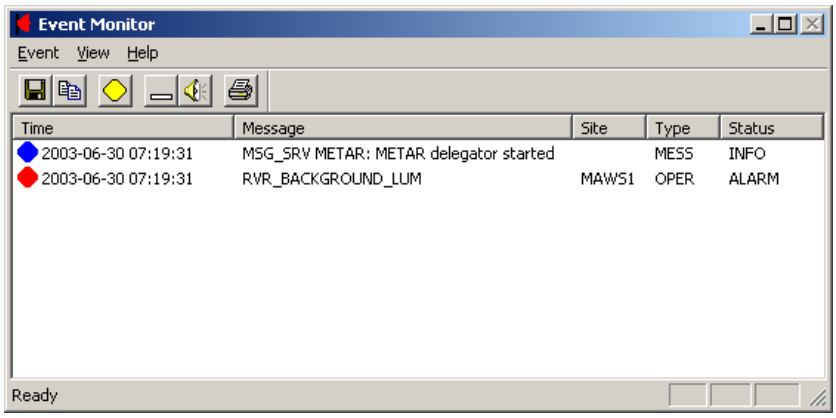

Figure 78 Event Monitor

Menu Options

The Event Monitor application contains three menus: **Event**, **View**, and **Help**.

1. The **Event** menu contains the following options:
   - **Save As** saves the Event Monitor screen to a file with a name specified by the user.
   - **Acknowledge** marks the active event as noticed.

- **Voice** activates the optional Midas IV voice alarm function. This application is not available with the TACMET system.
- **Print** prints the active window.
- **Print Setup** displays printer and connection options.

2. The **View** menu contains the following options:
   - **Bottom Line** minimizes the Event Monitor application into a single line that displays only the first unacknowledged event at the bottom of the screen. Double-click the event line to restore **Full Event Monitor** window.
   - **All Events** displays active events, that is, events that have not yet been acknowledged.
   - **Internal Events** displays internal events.
   - **Technical Events** displays technical events.
   - **Operational Events** displays operational events.
   - **Ice Detection Events**. This application is not available with the TACMET system.
   - **Message Notifications** displays information related to weather reports.
   - **Toolbar** shows/hides the toolbar.
   - **Status Bar** shows/hides the status bar.
   - **Hide when minimized** removes the **Event Monitor window** button (program icon and name) from the Windows taskbar (on the bottom of the screen) when the window is minimized. The application window can be returned by double-clicking the **Event Monitor icon** ( ) on the Windows status area (on the right corner of the taskbar).

3. The **Help** menu includes the following command:
   - **About Event Monitor** shows version and release information.

Toolbar

The toolbar contains shortcut icons for the most frequently used menu options. See Table 44 on page 118.

Table 44 Event Monitor Toolbar Buttons

Button	Name and Description
	Save As saves the active screen to a file.
	Copy copies the active screen to the Clipboard.
	Acknowledge marks the first unacknowledged event from the top of the list as acknowledged.
	Bottom Line displays a single event at the bottom of the screen.
	Voice turns the voice alarm function on and off. This application is not available with the TACMET system.
	Print prints the active screen.

NOTE

It is recommended to leave Event Monitor running whenever you use the system. This is indicated by the **Event Monitor** icon ( ) on the Windows status area (on the right corner of the taskbar, see Figure 79 on page 119).

Display Modes

Normally the Event Monitor application opens in a full-size window. You can also display the application as a single event line on the bottom of the screen by selecting **Bottom Line** from the **View** menu. In the single-line display mode, only the first unacknowledged event is shown. You can restore the **Event Monitor** to a full-size window by double-clicking the **Event Line**.

NOTE

Do not use the **Auto hide** option (Windows Taskbar Settings) with the **Bottom Line** command.

When the application is minimized, the window button (program icon and name) is displayed on the Windows taskbar. Additionally, an indicator of current event status is displayed on the status area (on the right corner of the taskbar). The color of the indicator changes depending on the current state of events. Yellow indicates that all events are acknowledged; red color reminds you of unacknowledged events.

Figure 79 Event Monitor Status Icon

You can hide the **Event Monitor** window button from the taskbar by selecting **Hide when minimized** from the **View** menu. You can restore the application icon by double-clicking the **Event Monitor** icon on the status area.

Viewing Events

In the **View** menu, you can select different event categories for viewing.

For each message, the following information is displayed:

- Time stamp (Time). The time stamp is updated when the message is acknowledged. The time stamp column also includes an alarm status icon. The color of the icon changes from red to yellow when the event is acknowledged.
- Message text (Message)
- Location of the event (Site)
- Category of the event (Type)
- Status of the event (Status).

Each event can have one of the following statuses:

OVER = The event is not currently active. This status never exists in the active event view.

ACKED = Operator has acknowledged the event.

ALARM = A serious condition exists (for example, one of the sensors is not responding).

WARNING = A warning condition exists (for example, one of the sensors requires service).

INFO = Connection to event server is not correctly established. The alarm monitor locally generates this alarm.

Acknowledging Events

You can acknowledge the first unacknowledged event with the toolbar icon or by selecting the **Acknowledge** option from the **Event** menu.

When you acknowledge an event, the icon of that event changes from red to yellow. When all events are acknowledged, the **Event Monitor** icon on the taskbar changes from red to yellow.

Checking New Events

To check new events, do the following:

1. In the Windows status area, double-click the **Event Monitor** icon . The **Event Monitor** window opens.
2. In the **View** menu, select the event types you want to see.
3. Check the latest unacknowledged event in the list (the topmost with red icon).
4. When you have checked the latest unacknowledged event, click toolbar icon . The event is now acknowledged.
5. Minimize the application window. You can also use the **Bottom Line** command to minimize the window to a line showing the latest event. Double-click the event line to restore the full application window.

Event Messages

The event messages are explained in Table 43 on page 114.

Table 45 Event Messages

Event Message	Explanation
1_MAWS_SENSOR_MISSING_DATA	The system has received no PTU data (Pressure Sensor PMT16A or Air Temperature and Relative Humidity Sensor QMH101M) within a specified time.
1_RAIN_SENSOR_MISSING_DATA	The system has received no data from Rain Gauge QMR101M within a specified time.
1_SA20_METAR DATA MISSING	Lightning Detector SA20M cannot provide all the needed data for METAR.
1_TB_SENSOR_MISSING_DATA	The system has received no data from Lightning Detector SA20M within a specified time.

Table 45 Event Messages (Continued)

Event Message	Explanation
CEILO DATA MISSING	The system has received no data from Ceilometer CT25KAM within a specified time.
FD_MISSING_DATA	The system has received no data from Visibility and Present Weather Sensor PWD11A within a specified time.
MOR_LEVEL_DOWN	MOR = Meteorological Optical Range = visibility. The system reports you between which SPECI limit values the 10-minute average is changing. Limits used are 0 ... 800, 800 ... 1500, 1500 ... 3000, 3000 ... 5000, and 5000 ... 8000.
MOR_LEVEL_UP	
MSG_SRV METAR: METAR delegator started	MSG_SRV service is ready to handle METAR requests.
MSG_SRV METAR: SENT TO AFTN	METAR report was sent to the output line.
MSG_SRV SPECI: Observer Triggered	SPECI report was triggered by the observer.
MSG_SRV SPECI: Temperature changing	Temperature has risen 2 °C or more compared to the last sent METAR. MIDAS IV METAR service notices the temperature difference and proposes SPECI.
OBJECT INFORMATION CONFLICT DETECTED BY SERVER A	The system has detected an incorrect number of ROA objects. One of the following has occurred: 1) A service is not running. 2) End user has closed an obligatory application. 3) METAR/SPECI template has not been opened.
RVR_BACKGROUND_LUM	To be ignored.
WAD DATA MISSING	The system has received no data from the wind sensor within a specified time.
WIND SPEED -999.0	Instant wind speed data missing.
WIND DIRECTION -999	Instant wind direction data missing.

Diagnostic Monitor

The Diagnostic Monitor (**ROA Diagnostics**) application is a tool for monitoring the status of the MIDAS IV system. In Diagnostic Monitor, you can view the status of a CDU (Central Data Unit), ROA (Remote Object Architecture) objects and ROA users. You can also check the location of a sensor.

When you get an Internal Event message in Event Monitor, there may be a problem with the CDU. In such a situation, you need to use Diagnostic Monitor to view the system status more closely. When there is a Technical Event message in Event Monitor, you need to use Diagnostic Monitor to look up the location of the sensor causing the event.

CAUTION Diagnostic Monitor is also an installation tool used by Vaisala personnel. For this reason, it contains some functions you must not use. Incorrect use of these functions can result in serious system problems. This manual includes instructions only for those functions that you can safely use in your troubleshooting tasks. Do not use functions that are not covered in this manual.

When starting troubleshooting with Diagnostic Monitor, you need to connect to the system in question.

1. Select **System - Connect**.
2. The **Connect** window appears.
3. Select the CDU (for example MIDAS IV TACMET) and click **OK**.
4. The **Statuses** tab appears.

Statuses Tab

Figure 80 on page 122 shows the Diagnostic Monitor main window/ **Statuses** tab for a duplicated system.

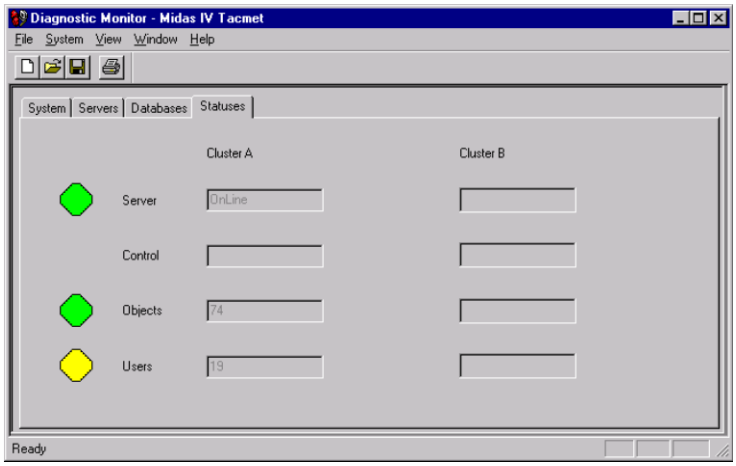

Figure 80 Diagnostic Monitor Statuses Tab

The **Statuses** tab is the most important tab for troubleshooting tasks.

NOTE The **System**, **Servers**, and **Database** tabs are mainly intended for Vaisala internal use.

In single-CDU systems, the **Cluster B** column in the **Statuses** tab is not used. **Cluster A** column shows when the CDU is working properly (**OnLine**) and when it is out of order (**Missing**).

In a single-CDU system, the **Statuses** tab includes three icons:

Server = Shows the status of the primary CDU.

Objects = Shows the status of the ROA data objects in the system.

Users = Shows the status of the ROA users in the system.

The color of the **Server** icon indicates the status of a CDU.

- Green color indicates that the CDU is running correctly.
- Red and yellow colors indicate problems in physical connections, network configuration, or ROA core services.

ROA Object

A ROA object is a runtime data container used by the remote object architecture. The data set it contains can be one of the following:

- Measured weather parameter values produced by a sensor
- Calculated values produced by meteorological services
- Alarm messages produced by the Alarm Service
- Weather report data.

The status of ROA objects in your system is indicated in the **Statuses** tab by the color of the **Objects** icon. In a normal situation, the **Objects** icon is green. If it is red or yellow, you need to open the **Objects** window by selecting **View - Objects**. In the **Objects** window, you can see the name, status, and value of the problem object and open a data item window for it.

Figure 81 on page 124 shows the **Objects** window. The window is similar for all system types. You can display the **Objects** window by selecting **Objects** from the **View** menu.

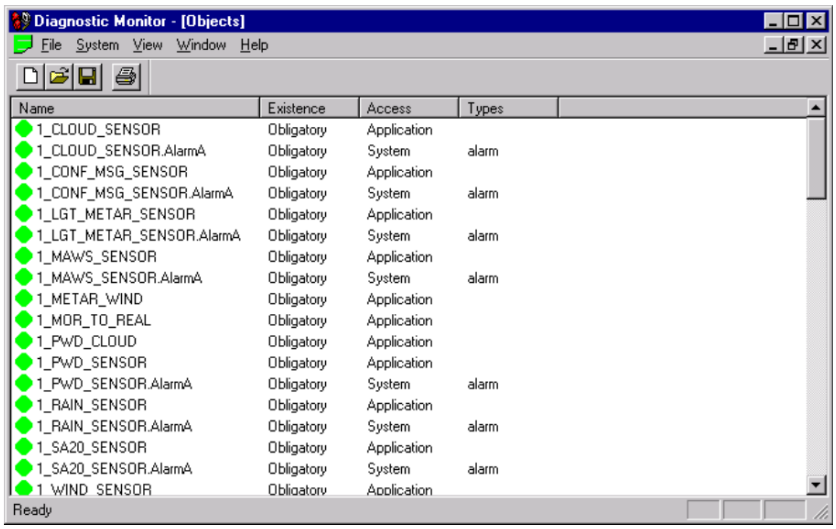

Figure 81 Objects Window in Diagnostic Monitor

The columns in Figure 81 on page 124 are explained below:

Name = The **Name** column shows the ROA object name. By double-clicking the name (of objects having **Access** type **Application**), you can open a data item window for this object and view data items belonging to it.

Existence= In the **Existence** column, the system shows the status of the ROA object in question. In single-CDU systems, the normal status is **Obligatory**.

In error situations, the status can be either **Missing** or **Unknown**. A **Missing** status is also shown by the red object status icon.

When the existence of a ROA object is **Missing**, the system sends an Internal message **Object information conflict** to Event Monitor. A **Missing** object status means that the object is not running properly in the system or, in rare situations, that the object is missing from the system altogether.

If the existence of a ROA object is **Unknown** (yellow), it usually means that there is an application running for which you do not have a proper license. See also Table 46 on page 125.

Access = Objects are divided into two groups by their access type: **Application** and **System**. If an object has the access type **Application**, you can open a data item window for that object by double-clicking its name. Objects with the access type **System** are internal system objects, and you cannot open a data item window for them; they are only intended for system internal use.

Types = The **Types** column contains programming information intended for Vaisala internal use.

Table 46 Existence Column in Objects Window

Existence	Explanation
Obligatory (green icon)	A system program running in the CDU.
Unknown (yellow icon)	An unlicensed application. Close the application and contact Vaisala for more licenses if necessary.
Missing (red icon)	The object is missing. You may need to reboot the system.

The object status icon is in the leftmost column. This icon shows the status of the ROA object. The icon can be green, red, or yellow. The green icon indicates normal status.

Red and yellow colors indicate missing objects, license violations, or other irregularities related to ROA objects. When the Objects icon is red or yellow, you need to view further object details in the data item window related to each object.

Table 47 on page 126 explains the meaning of the status icon colors in the Objects window and gives troubleshooting instructions.

Table 47 Color of Object Status Icon Explained

Color of Object Status Icon	Explanation	Action
Green	Object is running correctly.	No action needed.
Yellow	There is a non-configured program running in the system (usually a Vaisala internal tool).	Stop the non-configured program in Windows Control Panel.
Red	An object is missing, or a non-licensed application is running in the system.	Restart the missing object in Windows Control Panel, or close the non-licensed application in the program and contact Vaisala for more licenses if necessary.

Data Item Window

Figure 82 on page 127 shows the data item window. You can display the data item window by double-clicking the icon of an object in the **Objects** window. The data item window can be displayed for objects that have **Application** access type.

Figure 82 on page 127 shows the data item window for ROA object 1_PWD_SENSOR.

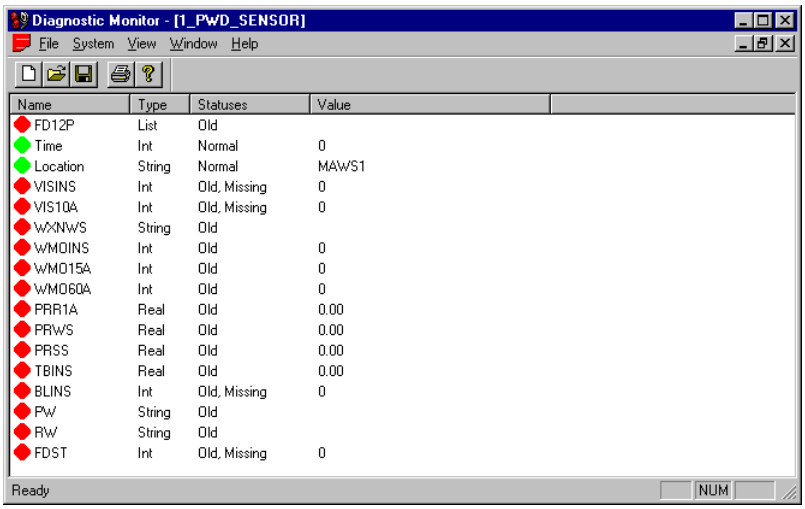

Figure 82 Data Item Window for 1_PWD_SENSOR

The columns in Figure 82 on page 127 are explained below:

Name = The **Name** column shows the data item name. One ROA object includes several data items. The data item named **Location** shows the location code of the object.

Type = The **Type** column contains programming information intended for Vaisala internal use.

Statuses = The **Statuses** column is important for ensuring the quality of data in the system and in end-user applications.

The information in the **Statuses** column is updated several times a minute. When the connection between a sensor and the CDU is broken, the information is no longer updated, and the status changes to **Old** and finally **Missing**. If the line is working properly, but the value measured by the sensor is out of the defined validity range, the status is **Invalid**. These statuses correspond with the ones used in end user applications, for example Weather View.

Value = The **Value** column shows the data item value.

ROA User

A ROA user is a program running in the MIDAS IV system. The term "user" should be understood from the system's point of view: ROA users are applications and programs that are using the CDU's services.

NOTE	In this context, the word **user** does not refer to the end user of MIDAS IV PC.

A ROA user is one of the following:

- Workstation application, for example, Weather View, METAR/ SPECI Template
- System program.

The status of ROA users in your system is indicated in the **Statuses** tab by the color of the **Users** icon. In a normal situation, the **Users** icon is green. If it is red or yellow, you need to open the **Users** window by selecting **View - Users**. In the **Users** window, you can see the name, address, port, and status of the problem ROA user.

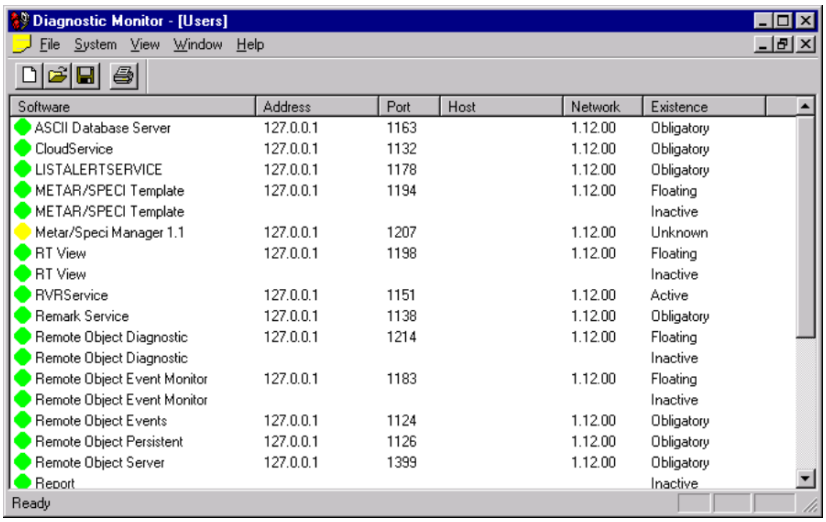
Diagnostic Monitor - [Users]
File System View Window Help
Software Address Port Host Network Existence
ASCII Database Server 127.0.0.1 1163 1.12.00 Obligatory
CloudService 127.0.0.1 1132 1.12.00 Obligatory
LISTALERTSERVICE 127.0.0.1 1178 1.12.00 Obligatory
METAR/SPECI Template 127.0.0.1 1194 1.12.00 Floating
METAR/SPECI Template Inactive
Metar/Speci Manager 1.1 127.0.0.1 1207 1.12.00 Unknown
RT View 127.0.0.1 1198 1.12.00 Floating
RT View Inactive
RVRService 127.0.0.1 1151 1.12.00 Active
Remark Service 127.0.0.1 1138 1.12.00 Obligatory
Remote Object Diagnostic 127.0.0.1 1214 1.12.00 Floating
Remote Object Diagnostic Inactive
Remote Object Event Monitor 127.0.0.1 1183 1.12.00 Floating
Remote Object Event Monitor Inactive
Remote Object Events 127.0.0.1 1124 1.12.00 Obligatory
Remote Object Persistent 127.0.0.1 1126 1.12.00 Obligatory
Remote Object Server 127.0.0.1 1399 1.12.00 Obligatory
Report Inactive
Ready

Figure 83 Users Window in Diagnostic Monitor

The columns in Figure 83 on page 129 are explained below:

Software = The **Software** column shows the name of the ROA user.

Address = The **Address** column shows the IP address of the computer running the software in question.

Port = The **Port** column shows the TCP/IP port of the computer running the software in question.

Host = The **Host** column contains information intended for Vaisala internal use.

Network = The **Network** column shows the version number of the ROA network library used in the application. The version number consists of three groups separated by a dot, for example, 1.43.03. The first two groups should be the same for each ROA user. If they are not, an old version of the ROA user in question is running in the system.

Existence= The **Existence** column shows the status of the ROA user. A ROA user can be **Obligatory**, **Violation**/**Unknown**, or **Missing**.

The normal status is **Obligatory**. If the system cannot find a ROA user, the status turns **Missing**. This means that a system program has stopped running, or that an end user has inadvertently closed an application that needs to be constantly open in a workstation (METAR/SPECI).

If the ROA user status is **Violation/Unknown**, it means that there is a non-licensed or non-configured ROA user running in the system.

You might also see the statuses **Floating** and **Inactive** in the Existence column. These statuses are mainly intended for Vaisala internal use.

SensorIO Monitor

SensorIO Monitor is a remote maintenance application. It is used for monitoring the communication port, the field devices, and the field device network communication.

SensorIO Monitor contains two windows: the **Sensor Status Monitor** window for showing the status of field devices, and the **Event Log** window for monitoring the communication from field devices.

CAUTION	SensorIO Monitor is also an installation tool used by Vaisala personnel. For this reason, it contains some functions you must not use. Incorrect use of these functions can result in serious system problems. This manual includes instructions only for the functions that you can safely use in your troubleshooting tasks. Do not use functions that are not covered in this manual.

You can hide and show the toolbar and status bar by selecting the corresponding **View** menu options. Toolbar and status bar are shown on the screen by default.

Sensor Status Monitor Window

In SensorIO Monitor, you can monitor the status of sensor communication in the **Sensor Status Monitor** window.

The window shown in Figure 84 on page 131 appears by default when you open the SensorIO Monitor application. You can also display it by selecting **View - Status View**.

The **Sensor Status Monitor** window shows a list of all sensors configured in your TACMET MAWS system.

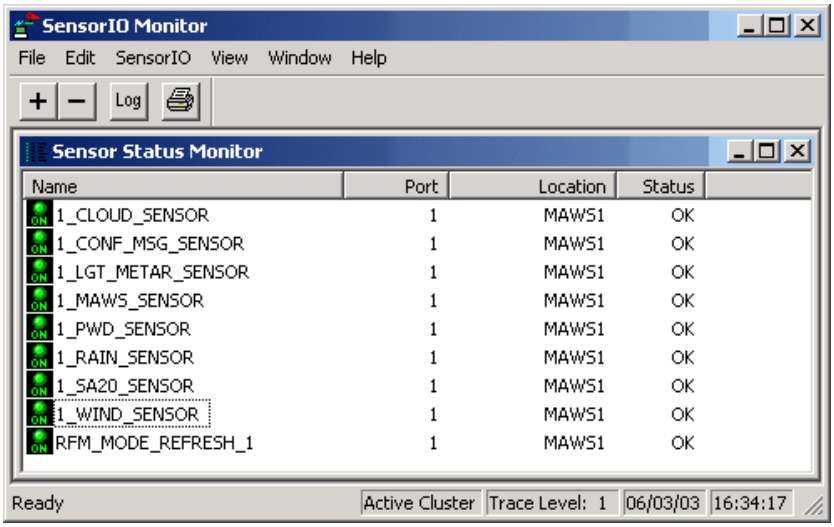

Figure 84 Sensor Status Monitor Window

The columns in Figure 84 on page 131 are explained below:

Icon = The connection status icon is the leftmost column on the window. The LED icons in the column display the status of each field device configured in the system. The status information is updated several times a minute. See Table 48 on page 132 for details.

Port = The **Port** column shows the number of the port to which the sensor is connected.

Status = The **Status** column shows the sensor status. See Table 49 on page 132 for details.

The colors and text in the connection status icon are explained in Table 48 on page 132.

Table 48 Explanation of Connection Status Icon

Icon color and text	Explanation
Green ON	Normal situation. Connection OK.
Yellow	Active connection.
Yellow TMIT	A lengthy data transfer is on the process.
Red ER	Problems in communication between sensors and CDU.
Gray OFF	Sensor is not in use.
Blue CMD	Sensor is in maintenance mode.

Table 49 on page 132 explains the different statuses.

Table 49 Explanation of Status Column

Status	Explanation
OK	Communication between sensors and CDU is running correctly.
Error	Problems in communication between sensors and CDU.
Command Mode	Sensor is in maintenance mode.

When you right-click a sensor name, you can view more information on the sensor by selecting **Sensor Details** from the context menu. The **Field Device Status** window appears, see Figure 85 on page 133.

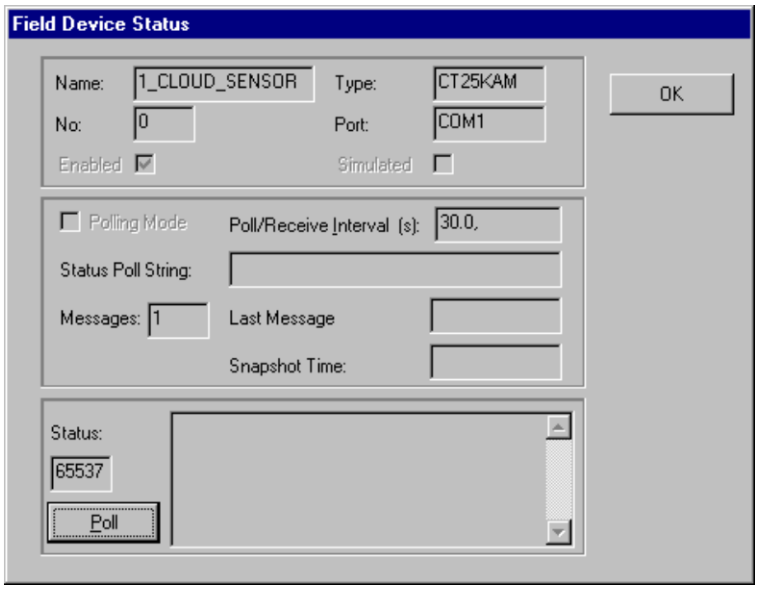

Figure 85 Sensor Details in Field Device Status Window

Event Log Window

The **Event Log** window contains detailed information on sensor communications. It displays the latest sensor events received from the system.

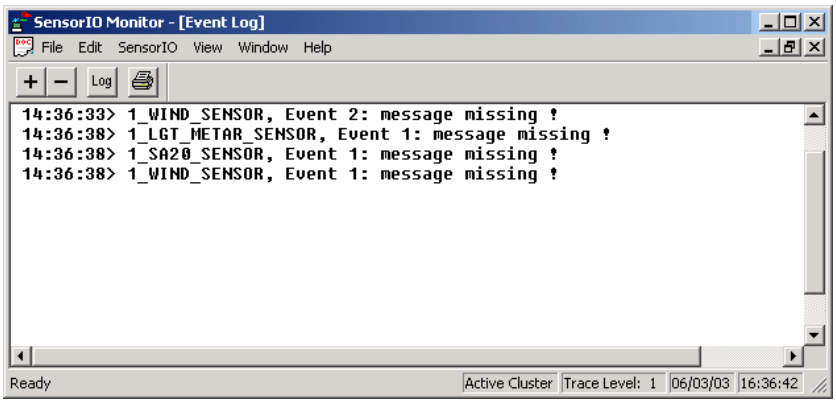
SensorIO Monitor - [Event Log]
File Edit SensorIO View Window Help
Log
14:36:33> 1_WIND_SENSOR, Event 2: message missing !
14:36:38> 1_LGT_METAR_SENSOR, Event 1: message missing !
14:36:38> 1_SA20_SENSOR, Event 1: message missing !
14:36:38> 1_WIND_SENSOR, Event 1: message missing !
Ready
Active Cluster
Trace Level: 1
06/03/03
16:36:42

Figure 86 Event Log Window

The **Event Log** window shows the time of the event, the name of the sensor, the event number, and the sensor message text, for example, `message missing!`.

You can adjust the amount of details displayed in the **Event Log** window with the **Trace Level** buttons. The higher the trace level is, the more details are shown in the **Event Log**. You can select a trace level from two to nine.

When you click the **Toggle Logging** icon on the toolbar, the contents of the event log are stored in a log file on your hard disk.

CHAPTER 5

MAINTENANCE

This chapter provides information that is needed in the basic maintenance of TACMET MAWS.

Periodic Maintenance

Under normal conditions, TACMET MAWS weather station needs only a minimal amount of maintenance. In general, it is not advisable to repair sensors in the field.

Logger Enclosure QME101M

Logger tube QME101M requires a minimal amount of maintenance. Field repairs are accomplished by replacing the complete module.

Mains Power Supply QMP201

QMP201 requires a minimal amount of maintenance. Field repairs are accomplished by changing the battery or the complete module. The expected battery life expectancy is 3 to 5 years.

To change the battery (the spare battery is in transit case QTR103):

1. Turn the power off (the switch is on the bottom of the QMP201 unit).

2. Open the battery compartment with the screwdriver.
3. Detach the plugs from the flat connectors by pulling them (see Figure 87 on page 136).

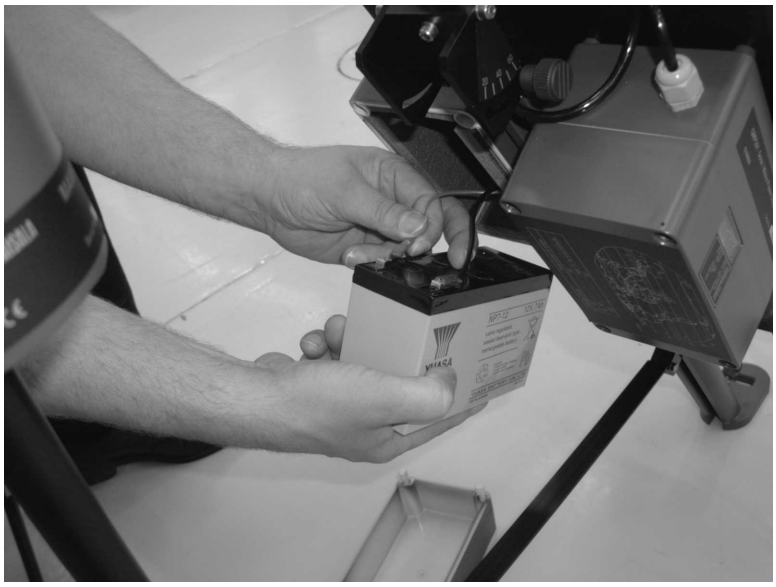

Figure 87 Changing the Battery

4. Change the battery and attach the flat connectors.
5. Close the battery compartment. Make sure you screw the screws all the way, so the compartment remains watertight.
6. Turn the power on.

Solar Panel

With permanent installations, inspect the module twice a year for overall integrity. Make sure that connections to the battery are tight and free of corrosion.

With mobile TACMET MAWS, perform these inspections every time when setting up the station.

Dirt accumulation on the module's front surface can reduce the light energy collected by the module, decreasing power output. If the module surface is dirty, gently clean it with a soft cloth or sponge using water and mild detergent.

CAUTION	Do not use a scrub brush; it may damage the module's front surface.

Power Supply and Connection Unit QMP202

QMP202 requires a minimal amount of maintenance. Field repairs are accomplished by replacing the complete module. The expected battery life expectancy is 3 ... 5 years.

Mains Power Supply QMP211

QMP211 requires a minimal amount of maintenance. Field repairs are accomplished by changing the complete module.

NOTE	Do not open the mains power supply unit.

Handheld Terminal QMD101M

Under normal conditions, QMD101M needs only a minimal amount of maintenance. In general, it is not advisable to repair QMD101M in the field. Field preventive maintenance is limited to cleaning the display periodically, if necessary. Field repairs are accomplished by changing the complete terminal.

Radio Modem

The radio modem requires no field maintenance. Field repairs are accomplished by changing the complete unit. Only a qualified radio technician should service the equipment. Do not open the enclosure or attempt to adjust or repair your units.

Antenna

Antennas require a minimal amount of maintenance. Field repairs are accomplished by changing the complete antenna.

Global Compass MC-2G

If the compass gets dirty, clean it with water and mild soap only.

CAUTION	Do not use detergents or solvents of any kind as they might cause damage to the compass.

Cable Maintenance

Inspect cables for breaks, cracks in the protective coating or cable connectors, and bent, damaged, or misaligned pins. Also wipe off or remove excess dirt, dust, sand, and leaves.

Combined Wind Sensor WMS302M

It is recommended to check the ball bearings of the anemometer and the vane quarterly. If the anemometer or the vane is not rotating smoothly or creates detectable noise, replace the wind sensor with the spare in the transit case QTR103 and notify the Helpdesk.

Rain Gauge QMR101M

To ensure reliable and accurate measurements, we recommend that the following checks be carried out at each visit to the rain gauge.

NOTE	If the gauge is still connected to the data logger and logger is operating, be careful not to tip the spoon/bucket when carrying out the following operations.

1. Inspect the funnel for any damage or blockage. At certain times of year, leaves may have accumulated into the funnel. Dirt and dust can also block the grille preventing or reducing the flow rate to a slow drip to the buckets beneath. Remove all obstacles from the funnel.
2. Check that the gauge is still level. It is surprisingly easy for an apparently immovable gauge to become tilted as a result of small ground movements, vandalism, or just an inquisitive finger.

3. Clean the spoon from dust and dirt once or twice a year to ensure a precise measuring.

Air Temperature and Relative Humidity Probe QMH101M

Calibration and maintenance of the air temperature and relative humidity probe should be performed at regular intervals, depending on the conditions of use and desired accuracy. The validity of the readings should be checked once a year.

Pressure Sensor PMT16A

PMT16A requires no periodic maintenance.

Present Weather Detector PWD11A

PWD11A is designed to operate continuously for several years without maintenance other than cleaning of the lenses and the DRD sensing surface (see Figure 88 on page 140). No initial calibration of PWD11A is needed, because the sensor has been calibrated at the factory. Periodic maintenance of the PWD11A Present Weather Detector includes:

- Cleaning of the transmitter and receiver lenses and hoods
- Cleaning of the DRD Rain Detector.

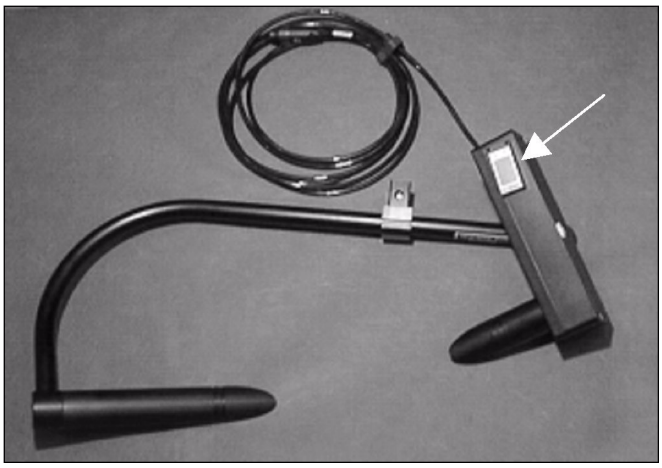

Figure 88 Present Weather Detector (Arrow Pointing to DRD)

NOTE	Some erroneous data may be generated due to cleaning the sensor.

Cleaning of the Transmitter and Receiver Lenses and Hoods

The lenses of the PWD11A transmitter and receiver units should be relatively clean to get reliable results. With dirty lenses, the shown visibility values are not reliable. Cleaning should be done every six months or more often depending on the conditions (for example, if there are roads nearby, more cleaning will be necessary).

1. Clean the lenses with a lens cleaning wipe. Be careful not to scratch the lens surfaces. Lenses should dry up indicating that the lens heating is functioning.
2. Check that the hoods and lenses are free of condensed water or ice and snow deposits.
3. Wipe the dust from the inner and outer surfaces of the hoods.

Cleaning DRD Rain Detector

The capacitive rain detector DRD should be cleaned every six months or more often depending on the conditions.

CAUTION	The measuring principle does not allow for proper ESD protection of the DRD electronics, so you must follow the instructions below:

1. Ground your hand by touching grounded metallic parts of the installation to remove excessive static charges from your body.
2. Clean the DRD rain detector carefully with a soft, lint-free cloth moistened with mild detergent. Be careful not to scratch the surface.
3. Check that the detector is free of ice and snow deposits.

Storage

Store PWD11A in its transit case in dry conditions, not in the open air. Storage conditions are:

- Temperature -40 to +70 °C (-40 to +158 °F)
- Relative humidity up to 95 %

Ceilometer CT25KAM

Periodic maintenance is normally limited to window cleaning. In addition, alarms should be checked regularly with the handheld terminal.

CAUTION	Ceilometer should never be opened by unauthorized personnel. Opening it will void the warranty.

Window Cleaning

The ceilometer lens and window should always be clean of any dirt or particles during operation. Data messages include a warning if the window is contaminated.

After the system has detected contamination, it starts the blower, which removes contamination.

In case of the `Optics Contamin` alarm (see Table 21 on page 86) the window has to be cleaned.

CAUTION	Particles between the towel and the window will damage the anti-reflection coating in the long run. Therefore, instead of circular rubbing, the window should be wiped once across the window. If additional wiping is needed, a clean part of the towel should be used.

To clean the window:

1. Flush the window with water to remove coarse grains.
2. Clean the window with a lens cleaning wipe.

Storage

Place caps on all external connectors if stored unpacked for extended periods of time in an unconditioned area. Also, maintain a dust cover on the window during long periods of storage.

Lightning Detector SA20M

There are no customer serviceable components in SA20M. If the sensor fails, replace it with a known good unit.

Advanced Maintenance

The maintenance procedures described in this section should be accomplished only by a trained technician. The procedures are not meant to be accomplished outdoors on the field.

Replacing Anemometer Bearings in WMS302M

It is recommended to check the ball bearings of the anemometer quarterly. If the cup wheel is not rotating smoothly or it creates a detectable noise, the bearings must be replaced.

To replace the anemometer bearings, perform the following steps (refer to Figure 89 on page 143):

1. Loosen the hubnut (1) with your fingers or a 10-mm tool and remove the cup wheel (2).

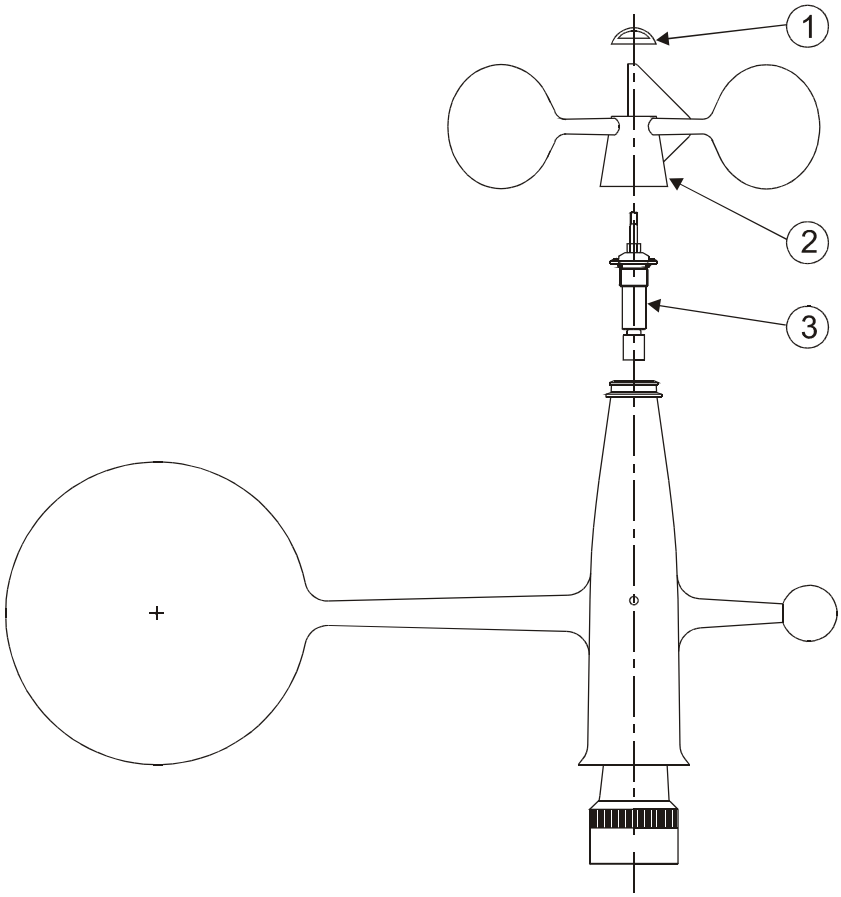

Figure 89 WMS302M Sensor Assembly

2. Remove the ball bearing assembly (3) by unscrewing it counterclockwise (with a 10-mm tool).
3. Insert a new bearing assembly (3). Tighten gently.
4. Fasten the cup wheel to the sensor. Tighten gently.

Replacing Air Temperature and Relative Humidity Probe QMH101M

To replace the QMH101M probe with a calibrated probe, perform the following steps:

1. Disconnect the Temp/Humidity cable (red-coded) from the TACMET MAWS.
2. Remove the sensor from the radiation shield by pulling gently.
3. After the sensor is detached from the radiation shield, pull the probe head out of the handle (see Figure 90 on page 144).

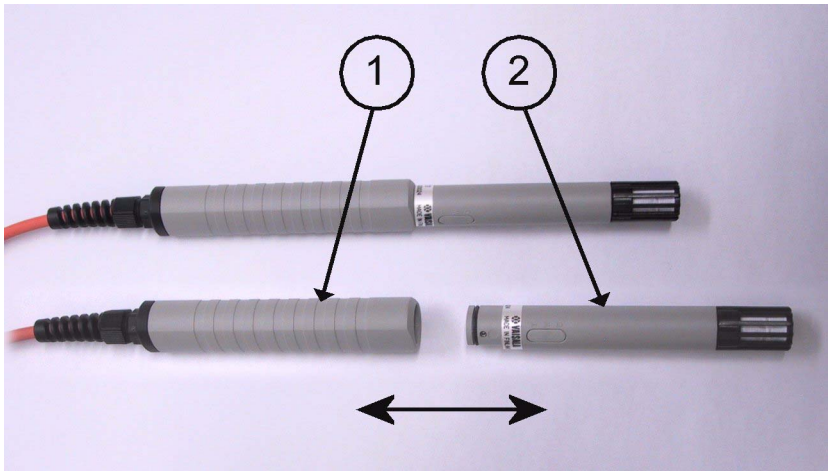

Figure 90 QMH101M Probe Maintenance

The following numbers refer to Figure 90 on page 144:

1 = Handle with cable

2 = Probe head

4. Attach the calibrated probe into the handle.
5. Push the sensor carefully back into the radiation shield.
6. Reconnect the cable.

Calibrating Pressure Sensor PMT16A

The TACMET MAWS software provides a means for one-point calibration of Pressure Sensor PMT16A.

Required equipment:

- Laptop PC with a terminal software (for example, HyperTerminal)
- Reference pressure sensor
- TACMET MAWS PC cable ZZ45202

Calibration procedure of PMT16A is the following:

1. Place the reference pressure sensor at the same level with PMT16A (located inside the tripod enclosure).

NOTE	Make sure the wind does not interfere with the reading of the reference barometer.

2. Connect the MIDAS IV PC to TACMET MAWS with the ZZ45202 cable.
3. If the MIDAS IV software is running, shut it down using TACMET Wizard.
4. Establish terminal connection to TACMET MAWS by launching the terminal software. The correct communication parameters are:
   - 4800 bps
   - 8 data bits
   - 1 stop bit
   - No parity
   - No handshaking
5. When data messages appear in the terminal software, type **open** and press **ENTER**.
6. Read the reference barometer reading.
7. Give the reference reading to TACMET MAWS. Type **PMT16CAL** *1003.7* (where *1003.7 hPa* is the reference reading) and press **ENTER**.

8. Check the readings given by TACMET MAWS:
   - Value = reference reading
   - Measured value = measured by TACMET MAWS
   - Offset = measured value - reference reading
9. Wait for a couple of minutes.
10. Check the pressure reading with the handheld terminal. It should be the same as the reference reading.
11. Repeat the calibration, if necessary.
12. Type **close** and press **ENTER** to close the terminal connection.
13. Shut down the terminal software.
14. Restart MIDAS IV using TACMET Configuration Wizard.

CHAPTER 6
TROUBLESHOOTING

This chapter lists the possible problems that may occur during the operation and possible solutions to these problems.

Software Operation

Table 50 Troubleshooting the Software

Problem	Probable Cause	Remedy
TACMET MAWS will not open for commands.	The terminal connection is not open.	Check the cable connection.
	MAWS is not receiving power.	Check connections and power supply.
MAWS is not sending anything (nothing is seen on the handheld terminal or PC screen).		Reset MAWS.
MIDAS IV shows slashes (/////) instead of measured values.	Cable connection problem.	Check the cable connections and the condition of the cables (see section Cable Maintenance on page 138).

For additional information on possible Microsoft® Windows® 2000 related software problems, launch **Event Viewer** from **Start - Settings - Control Panel - Administrative Tools**.

Solar Panel

Table 51 Troubleshooting the Solar Panel

Problem	Probable Cause	Remedy
The power output has decreased.	The module surface is dirty	Gently clean it with a soft cloth or sponge using water and mild detergent.

Table 52 QMP201 Battery LEDs

LED	Color	Explanation
Battery status LED	Green	Charging
	Blank	Not charging
Charge LED	Green	OK
	Orange	Low
	Red	DC out off

Handheld Terminal

Table 53 Troubleshooting the Handheld Terminal

Problem	Probable Cause	Remedy
The handheld terminal does not power up normally.	The handheld terminal is not connected to a power outlet.	Check the cable connections.
The backlight is not on.	After a certain time, the lights will go off to maintain low power consumption.	Press any key on the keypad.
The "Not Available" text appears on the screen.	Your system does not have the Enhancement sensors connected.	Connect the sensors. If you have the Basic system, ignore the text.
You are trying to change station dependent settings, but you cannot access the input field.	A communication problem between TACMET MAWS and the handheld terminal.	Check the cable connections. The handheld terminal must be connected to TACMET MAWS with a hard wire, when changing the station dependent settings.

PWD11A

CAUTION	Servicing the equipment must be performed by qualified personnel.

If PWD11A is not working properly:

1. The lenses may be excessively contaminated. Alarm is received.
   - Clean the lenses.
2. One of the hoods has been filled with snow, leaves, or other things. Alarm is received.
   - Clean the hoods.
3. Check that there are no foreign objects in the sample volume.
   - Tree branches, loose cables, or any other moving objects in the sample volume may cause sudden changes in the scatter signal.
4. Check the power supply voltage and cable connections.
5. Check that all the connectors are properly inserted.
6. Check that there are no flashing lights close to PWD11A.
   - Flashing lights may cause PWD11A to detect peaks in the optical signal.

CT25KAM

Warnings

Table 54 Troubleshooting Ceilometer

Status Message Info	Probable Cause	Remedy
Optics contaminated warning (on handheld terminal).	Bird droppings, leaves, dust, or the like has contaminated the window.	Clean the window.

Failure Diagnosis

In case of malfunction, do the following:

1. Check the cable connections.
2. Check the presence and correctness of line voltage.
3. Check the operational states of the LEDs in the unit.
4. At the data line, check that the connection is correct.

The diagnosis is made based on the information given in the status message.

SA20M

Table 55 Troubleshooting SA20M

Problem	Probable Cause	Remedy
No data transfer from SA20M	Bad connection.	Check that all cables are properly connected to SA20M.
	Cable failure.	Check cable integrity.
	No power.	Restore power to SA20M.
	Poor siting of SA20M. Too close to obstruction (such as metal fences) that is causing signal degradation.	Remove any obstructions.
SA20M appears to be reporting lightning data in the opposite direction of the expected location (180 degrees off).	The sensor is not properly grounded.	Check the grounding connection wire.

Technical Support

For technical questions, contact the Vaisala technical support:

E-mail helpdesk@vaisala.com

Phone (int.) +358 9 8949 2789

Fax +358 9 8949 2790

Return Instructions

If the product needs repair, please follow the instructions below to speed up the process and avoid extra costs.

1. Read the warranty information.
2. Write a Problem Report with the name and contact information of a technically competent person who can provide further information on the problem.
3. On the Problem Report, please explain:
   - What failed (what worked / did not work)?
   - Where did it fail (location and environment)?
   - When did it fail (date, immediately / after a while / periodically / randomly)?
   - How many failed (only one defect / other same or similar defects / several failures in one unit)?
   - What was connected to the product and to which connectors?
   - Input power source type, voltage and list of other items (lighting, heaters, motors etc.) that were connected to the same power output.
   - What was done when the failure was noticed?
4. Include a detailed return address with your preferred shipping method on the Problem Report.
5. Pack the faulty product using an ESD protection bag of good quality with proper cushioning material in a strong box of adequate size. Please include the Problem Report in the same box.
6. Send the box to:.

   Vaisala Oyj

   VSO Service

   Vanha Nurmijärventie 21

   FIN-01670 Vantaa

   Finland

CHAPTER 7
TECHNICAL DATA

This chapter provides technical data of the TACMET Weather Station.

Polling/Reporting Times

Table 56 Sensor Polling/Reporting Times

Parameter	Polling	Reporting
Wind direction	1 s	5 s
Wind speed	1 s	5 s
Air temperature	10 s	1 min
Relative humidity	10 s	1 min
Air pressure	10 s	1 min
Precipitation	1 min	1 min
Lightning	5 s	5 s
Sky condition	30 s	30 s
Present weather	30 s	30 s

Battery Information

The column shows charging times, when batteries have not been used for a long time, for example, after extended storage period

Table 57 Battery Information

Battery	Charging Time	Service Length without AC Power	Expected Battery Life
QMP201	12 h max.	7 days with landline use (no radio modems in use) and without any charge from the solar panel. 1.5 days with radio modems and without any charge from the solar panel.	Usually 3 to 5 years.
QMP202	24 h max.	24 hours.	

Specifications

AWS Logger QML102T

Table 58 QML102T Specifications

Property	Description/Value
Processor	32-bit Motorola
A/D conversion	16-bit
Data logging memory	1.7 Mbytes internal Flash memory
Sensor inputs	10 Analog inputs (20 single ended inputs)
	2 counter / frequency inputs
	Internal channel for PMT16A pressure transducer
Typical accuracy across measured temperature range -50 ... +80 °C	Better than ± 0.06 °C
Maximum error across measured temperature range -35 ... +50 °C	Less than ± 0.12 °C
Maximum error at 0 °C	Less than ± 0.06 °C
Voltage measurement	
±2.5V range	Better than 0.08 % F.S. ± 150 μV
±250 mV range	Better than 0.18 % F.S. ± 15 μV
±25 mV range	Better than 0.18 % F.S. ± 3 μV
±6.5 mV range	Better than 0.18 % F.S. ± 3 μV
Frequency measurements	0.003 % + resolution 241 ns (up to 2 kHz)
Common mode range	+5 V / -4 V
Real-time clock	Better than 20 sec./month
Serial communication	
Standard	RS-232 for maintenance 2 pcs RS-232 for handheld display and laptop PC (max. distance 70 m, 230 ft.)
Optional	2 pcs RS-485 for smart sensors and remote displays, speed 300 ... 4800 bps (max. distance 2.5 km, 8200 ft.)
Voltage (external powering)	8 ... 14 VDC recommended (30 V max)
Standard internal battery	1.2 Ah/6 V
Temperature (operating)	-40 ... +55 °C (-31 ... +131 °F)
Temperature (storage)	-50 ... +70 °C (-58 ... +158 °F)
Humidity	0 ... 100 %RH
Emissions	CISPR 22 class B (EN55022)
ESD immunity	IEC 61000-4-2
RF field immunity	IEC 61000-4-3

Table 58 QML102T Specifications (Continued)

Property	Description/Value
EFT immunity	IEC 61000-4-4
Surge (lightning pulse)	IEC 61000-4-5
Conducted RF immunity	IEC 61000-4-6

Solar/Mains Power Supply QMP201 with Solar Panel SOLAR12

Table 59 Solar Panel SOLAR12 Specifications

Property	Description/Value
Peak power (P_p) @ 1 kW/m^2 @ +25 °C	12 W
Guaranteed min. peak power	10.8 W
Voltage @ peak power (V_{pp}), typical	16.7 V
Current @ peak power (I_{pp}), typical	0.72 A
Short-circuit current (I_{sc}), typical	0.8 A
Temperature coefficient of current	0.25 mA/°C
Temperature (operating)	-40 ... +85 °C (-40 ... +185 °F)
Dimensions w × h × d	268 × 540 × 15 mm
	10.6 × 21.3 × 0.6 in
Weight	1.5 kg (53 oz.)
Output cable included	6 m (20 ft.), 2 × 1.55 mm^2

Table 60 7 Ah Backup Battery

Property	Description/Value
Type	Sealed. Lead-acid
Nominal voltage	12 V
Nominal capacity	7Ah
Self discharge	3 %/month
Expected lifetime	4 … 5 years
Dimensions w × d × h	151 × 65 × 97.5 mm
	5.9 × 2.6 × 3.8 in
Weight	2.8 kg (99 oz.)

Power Supply and Connection Unit QMP202

Table 61 24 Ah Back-up Battery Specifications

Property	Description/Value
Type	Sealed. Lead-acid
Nominal voltage	12 V
Nominal capacity	24 Ah
Self discharge	3 %/month
Expected lifetime	4 … 5 years
Dimensions w × d × h	166 × 175 × 125 mm
	6.5 × 6.9 × 4.9 in
Weight	8.7 kg (19.2 lb.)

Handheld Terminal QMD101M

Table 62 QMD101M Specifications

Property	Description/Value
CPU	MC68EC000
	24-Bit external and 32-Bit internal address
	16-Bit on-chip bus for MC68EC000 bus operations
Power management	Static Design allows processor clock to be stopped
Clock speed	16.54 MHz
System integration	16 programmable peripheral chip selects. Interrupt controller with 13 flexible inputs. Programmable interrupt vector generator. Hardware and software watchdog timer. Lower power mode control.
System RAM	256 Kilobytes or 1 MB SRAM
FLASH storage	512 Kilobytes, 1 MB, or 2 MB
Display	Graphics LCD
Physical size	89 x 91 mm (3.5 x 3.57 in)
Pixels	160 x 160
Character cell size	8 x 16 (10 rows x 20 columns) or 6 x 10 (16 rows x 26 columns
CG set	256 PC character set & 16 programmable characters
LCD type	Reflective LCD with programmable contrast
Option for display	EL Backlight
Keyboard	25 keys (5 columns x 5 rows)
Type	Elastomer (Rubber Dome)

Table 62 QMD101M Specifications (Continued)

Property	Description/Value
Feedback	Audio speaker
Real time clock	24 Hour plus battery backed Month/Day/Year
Interface	14 pin quick connect micro connector or internal
Data transfer rate	Programmable to 38.4 kb/s
Handshaking	RTS/CTS, Xon/Xoff by the processor
External power	5 ... 14 VDC unregulated, via RS-232 interface (Pin 1 on 9 pin RS-232 D-Sub via pins 13 & 14 Micro Connector).
Current	17 mA @ 6 VDC typical
	80 mA worst case during FLASH write
	0.6 mA sleep mode
Size h × w × d	191 x 102 x 33 mm (7.5 x 4.0 x 1.3 in) without case expansion ring
Weight	450 g (16 oz.)
Operating temperature	-20 ... +70 °C (-4 ... +158 °F)
Operating humidity	Max. 90 %RH non-condensing

Radio Modem SATELLINE3AS

Table 63 SATELLINE 3AS Specifications

Property	Description/Value
Frequency range	380 ... 470 MHz
Channel spacing	12.5 / 25 kHz
Number of channels	160 / 80
Frequency stability	< ± 1.5 kHz
Type of emission	F1D
Communication mode	Half-Duplex
Carrier power	10 mW ... 1 W / 50 Ω
Carrier power stability	+2 dB / -3 dB
Adjacent channel power	Acc. to EN 300 220-1 / ETS 300 113
Spurious radiations	Acc. to EN 300 220-1 / ETS 300 113
Sensitivity	-116 ... -110 dBm (BER < 10 E-3)
Co-channel rejection	> -12 dB
Adjacent channel selectivity	> 60 dB / > 70 dB
Intermodulation attenuation	> 65 dB
Spurious radiations	< 2 nW
Interface	RS-232 or RS-422, RS-485
Interface connector	D 15, female
Data speed of RS interface	300 ... 38 400 bps
Data speed of radio interface	19 200 bps (25 kHz channel) 9600 bps (12,5 kHz channel)
Data formats	Asynchronous data
Operating voltage	9 ... 30 VDC
Power consumption	1.8 VA typical (receive)
	6.0 VA typical (transmit)
	0.05 VA typical (when DTR is 0)
Temperature range	-25 ... +55 °C (-13 ... +131 °F)
Antenna connector	TNC, 50 Ω, female
Construction	Aluminum enclosure
Dimensions h × w × d	137 x 67 x 29 mm (5.4 x 2.6 x 1.1 in.)
Installation plate	130 x 63 x 1 mm (5.1 x 2.5 x 5/128 in.)
Weight	250 g (8.8 oz.)

UHF Antennas

Table 64 UHF Antenna Specifications

Property	Description/Value
Frequency range	410 … 470 MHz
Gain	4 dBd (6 dBi)
Directivity: E-plane (vertical) H-plane (horizontal)	 35º Omni-directional 360º
Polarization	Vertical
Maximum power	50 W
Nominal impedance	50 Ω
VSWR: On center frequency For bandwidth of 20 MHz	 1.1 : 1 1.25 : 1
Connection	Connector (N-female) mounted underneath of cylindrical base of antenna
Operating temperature	-40 ... +55 °C (-40 ... +131 °F)
Dimensions w × h	440 × 650 mm (17.3 × 25.6 in.)
Weight	430 g (15 oz.)
Material: Radiator and Reflectors Base element	 Black painted steel Black anodized aluminum

Combined Wind Speed and Direction Sensor WMS302M

Table 65 WMS302M Specifications

Property	Description/Value
Measurement range Anemometer Vane	 0.5 ... 60 m/s (1 ... 117 kt) 0 ... 360 °
Accuracy Anemometer Vane	 ± 0.3 m/s (< 10 m/s) < 2 % (> 10 m/s) < ± 3 °
Threshold	< 1.0 m/s
Distance constant (anemometer)	1.6 m
Delay distance (vane)	1 m
Operating temperature	-40 ... +55 °C (-40 ... +122 °F)
Dimensions h × w	265 × 360 mm (10.4 × 14.2 in)
Weight	360 g (12.7 oz.)

Rain Gauge QMR101M

Table 66 QMR101M Specifications

Property	Description/Value
Sensor/transducer type	Self-emptying tipping spoon/magnet
Funnel diameter	160 mm (6.3 in)
Orifice (opening area)	200 cm^2 (31 in^2)
Sensitivity	0.2 mm (1/128 in)
Capacity	144 mm/h (5.7 in/h)
Accuracy	
< 24 mm/h (0.9 in/h)	< ± 5 %
< 120 mm/h (4.7 in/h)	< ± 10 %
Material	UV stabilized plastic
Cable	Included
Weight	380 g (13.4 oz.)

Air Temperature and Relative Humidity Sensor QMH101M

Table 67 QMH101M Specifications

Property	Description/Value
Range (Temperature)	-40 ... +60 °C (-40 ... +140 °F)
Range (RH)	0 ... 100 %
Accuracy (Temperature)	Better than ± 0.2 °C (± 0.36 °F)
Accuracy (RH)	± 2 %, 0 ... 90 %
	± 3 %, 90 ... 100 %

Pressure Sensor PMT16A

Table 68 PMT16A Specifications

Property	Description/Value
Accuracy	± 0.3 hPa incl. one year drift (with factory calibration)
Pressure range	600 ... 1100 hPa
Resolution	0.1 hPa
Operating temperature	-40 ... +60 °C (-40 ... +140 °F)

Present Weather Detector PWD11A

Table 69 PWD11A Specifications

Property	Description/Value
Measurement range of MOR	10 ... 20 000 m (32 ... 65 600 ft.)
Accuracy	± 10 %, range 10 ... 10 000 m (< 32 800 ft.)
	± 15 %, range 10 ... 20 km (32 800 ... 65 600 ft.)
Maximum power consumption	15 W without heating
	Max 20 W (10 ... 50 VDC)
Time constant	60 seconds
Update interval	15 seconds
Precipitation detection sensitivity	0.05 mm/h or less, within 10 minutes
Weather type identification	7 different types of precipitation (rain, freezing rain, drizzle, freezing drizzle, mixed rain/snow, snow, ice pellets) Precipitation (unknown type) Fog (mist), haze (smoke, sand) or clear

Table 69 PWD11A Specifications (Continued)

Property	Description/Value
Weather type reporting	WMO code table 4680
	Code letters for precipitation, NWS (National Weather Service, USA)
Precipitation intensity measurement	Range 0.00 ... 999 mm/h
	Accuracy ± 30 % (range 0.5 ... 20 mm/h, liquid precipitation)
Sun orientation	Sunlight into the light receiver must be avoided
Material	Anodized aluminum, black
Wind speed	Up to 60 m/s (116 knots)
Operating temperature range	-40 ... +55 °C (-40 ... +131 °F)
Operating humidity range	Up to 100 %RH
Dimensions w × d × h	720 × 320 × 220 mm (28.3 × 12.6 × 8.7 in)
Weight	2.8 kg (99 oz.)

Ceilometer CT25KAM

Table 70 CT25KAM Specifications

Property	Description/Value
Measurement range	0 ... 25 000 ft. (0 ... 7.5 km)
25 000 ft. acquisition time	15 s
Accuracy (against hard target)	± 2 % ± 25 ft.
Resolution	50 ft.
Number of layers	Up to 5
Range gates	500
Laser	Pulsed diode, InGaAs MOCVD
Wavelength	905 nm ± 5 nm at 25 °C (77°F)
Eye safety	In compliance with IEC825 and 21CFR1040
Measurement cycle	Programmable 15 ... 120 s
Microprocessor	Intel 16-bit CMOS 80C188EB
DC power consumption Total Measurement unit Window blower	 20 W 15 W 5 W
AC power	115 or 230 VAC, 45 ... 65 Hz Max. 240 W including heating, ± 15 %
Interfaces	RS-485
Data messages	Cloud hits and status only. Cloud hits, status, internal monitoring data, and full backscatter profile.
Dimensions w × d × h	316 × 256 × 710 mm (12 × 10 × 28 in)
Weight	14.5 kg (32 lb.)
Tilt correction sensor	Correction 0 ... 60°
Window conditioner	Automatic window blower and protection shield.
Temperature range	-50 ... +60 °C (-58 ... +140 °F)
Humidity	0 ... 100 % RH
Protection class	IP65
Vibration during operation	0.5 G, 10 ... 500 Hz (IEC68-2-6 FC)
EMC/EMI	CISPR 22B/FCC 15 Part J or
	IEC801-5 (2 kV), 3 V/m 14 kHz-1 GHz
	IEC801-3
	IEC 801-4 Level 3
Static	8 kV (IEC801-2 Level 4)
Electrical safety	EN60950

Lightning Detector SA20M

Table 71 SA20M Specifications

Parameter	Description/Value
Types of strikes detected	Cloud-to-cloud
	Cloud-to-ground
Maximum processing rate	5 000 strikes per minute
Operational Limits: Range Bearing	 0 ... 90 km (0 ... 50 nmi.) 0 ... 360º
Resolution: Range Bearing	 2 km (1 nmi.) 1 degree
Ranging accuracy 0 ... 28 km (0 ... 15 nmi.) 28 ... 55 km (15 ... 30 nmi.)	 ± 1 km (± 0.5 nmi.) ± 2.4 km (± 1.3 nmi.)
Directional accuracy	± 5º
Power	10 ... 18 VDC, 7 W, 0.5 A (typ) @ 13.8 VDC
Transient voltage surge protection	All lines
Weight	3.6 kg (8 lb.)
Dimensions w × d × h	310 x 310 x 130 mm (16 x 16 x 5 in)
Temperature	-35 ... +55 °C (-30 ... +130 °F)
Humidity	5 ... 100 %RH condensing
Standards	FAA Advisory Circular 150/5220-16
	RTCA/DO-191
	TSO-C110a